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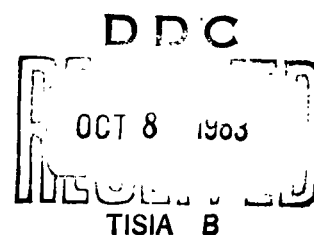
ARL 63-133

## THERMODYNAMIC PROPERTIES OF ARGON

ERIC BAUM  
G. L. CANN

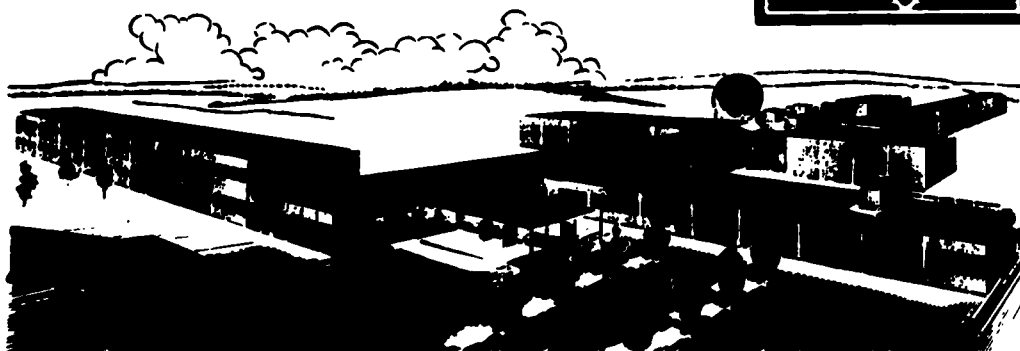
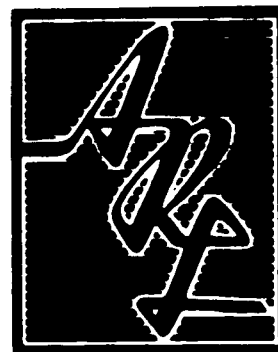
ELECTRO-OPTICAL SYSTEMS, INC.  
PASADENA, CALIFORNIA

AUGUST 1963



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# **THERMODYNAMIC PROPERTIES OF ARGON**

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**AUGUST 1963**

**Contract AF 33(657)-7940**

**Project 7116**

**Task 7116-03**

**AEROSPACE RESEARCH LABORATORIES  
OFFICE OF AEROSPACE RESEARCH  
UNITED STATES AIR FORCE  
WRIGHT-PATTERSON AIR FORCE BASE, OHIO**

## FOREWORD

This interim technical report was prepared by Electro-Optical Systems, Inc., of Pasadena, California, on Contract AF 33(657)-7940 for the Aerospace Research Laboratories, Office of Aerospace Research, United States Air Force. Dr. Gordon L. Cann was the Principal Investigator. The research reported herein was accomplished under Project-Task 7116-03, "Electric Propulsion Research" under the cognizance of Mr. Charles A. Davies of the Thermo-Mechanics Research Laboratory, ARN. The results contained herein were obtained during the period from 15 December 1961 to 14 December 1962.

## ABSTRACT

The thermodynamic properties of high temperature argon are calculated. The composition, composition derivatives, compressibility, enthalpy, entropy, equilibrium and frozen heat capacity, gamma and speed of sound, are calculated over the temperature range 1,000-25,000<sup>o</sup>K and pressure range 0.0001-100 atm. A Mollier diagram is enclosed.

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# CHART

Mollier Chart For Argon

Separate attachment

## 1. INTRODUCTION

The interpretation of argon arc plasma experiments requires the knowledge of the thermodynamic properties at high temperatures. Several calculations of argon properties have been reported (Ref. 1-6). These calculations, however, do not cover a sufficiently large range of temperature and pressure for all of the thermodynamic properties needed for the interpretation of experiments. The present work is intended to produce a self consistent set of the needed properties over a range of conditions which is wide enough to include most experimental conditions.

## 2. THERMODYNAMIC PROPERTIES

The composition of high temperature argon was calculated using a modification of the method of minimization of free energy introduced by White, Johnson and Dantzic (Ref. 7). The Gibbs free energy of a mixture of N chemical species containing  $Y_i$  moles of the  $i^{\text{th}}$  species was written in the form:

$$F/RT = \sum_i Y_i \left( \frac{F_i^0}{RT} + \ln \frac{P}{P_0} + \ln \frac{Y_i}{\sum_i Y_i} \right) + \frac{\Delta F_{rg}}{RT} \quad (2-1)$$

where

$F_i^0$  = standard free energy of specie i,

P = pressure in atmospheres

$\Delta F_{rg}$  = correction for real gas effects

The correction was applied to account for the fact that, while an isolated atom has an infinite number of electronic energy states available to it, the number of distinct states available is limited in a real gas by the presence of surrounding particles. The ionization energy is, therefore, a function of the overall properties of the gas. Several approximate theories have been advanced in recent years to quantify this correction (9-11). The most rigorous of these, for the range of temperatures of interest, appears to be that of Inglis and Teller (Ref. 11). The treatment of Unsold, while less rigorous, gives results very nearly the same as that of Inglis and Teller (Ref. 9).

In these calculations, the maximum principal electronic quantum number, corresponding to that energy state above which an electron can no longer be considered as being bound, was found using the I and T theory (Ref. 8).

$$g = 1.340 \left( \frac{Z^2 T \sum_i Y_i}{Y_e P} \right)^{2/15} \quad (2-2)$$

where the cut-off quantum number is the nearest integer smaller than or equal to  $g$ , and

$Z$  = effective nuclear charge

$Y_e$  = moles of electrons

The reduction in ionization energy,  $\epsilon$ , due to this effect was found from the Unsold theory (Ref. 9):

$$\frac{\epsilon}{RT} = \frac{1.51 \times 10^5}{T} \left( \frac{Y_e P}{\sum_i Y_i T} \right)^{1/3} \quad (2-3)$$

where  $T$  is in  $^{\circ}\text{K}$

$P$  is in atm.

The correction to the mixture free energy can be written:

$$\frac{\Delta F_{rg}}{RT} = - Y_e \frac{\epsilon}{RT} \quad (2-4)$$

#### Minimization of Free Energy

The method used to find the composition corresponding to the minimum free energy, as given by equation (2-1) was essentially the same as that given by White, Johnson and Dantzig (Ref. 7) except for the inclusion of the free energy correction term.

The free energy of the system is first expanded in a Taylor's series about the "current" composition, which, initially, is an arbitrary starting guess. The independent variables in this expansion are the changes in composition,  $X_i - Y_i$ , where  $Y_i$  is the current value,  $X_i$  is the next approximation.

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$$\Phi/RT(X) = F/RT(Y) + \sum_i \left. \frac{\partial F/RT}{\partial X_i} \right|_{X=Y} (X_i - Y_i) + \frac{1}{2} \sum_i \sum_k \left. \frac{\partial^2 F/RT}{\partial X_i \partial X_k} \right|_{X=Y} (X_i - Y_i) (X_k - Y_k) \dots \quad (2-5)$$

From equation (2-1), the derivatives are:

$$\frac{\partial F/RT}{\partial X_i} = \frac{F_i^0}{RT} + \ln P + \ln \frac{Y_i}{\sum_i Y_i} + \frac{1}{3} \frac{Y_e}{\sum_i Y_i} \frac{\epsilon}{RT} \quad i \neq 1 \text{ elec.} \quad (2-6)$$

$$\frac{\partial F/RT}{\partial X_i} = \frac{F_i^0}{RT} + \ln P + \ln \frac{Y_i}{\sum_i Y_i} + \frac{1}{3} Y_e \left( \frac{1}{\sum_i Y_i} - \frac{1}{Y_e} \right) \frac{\epsilon}{RT} \quad i=1 \text{ elec.} \quad (2-7)$$

The second derivative is taken neglecting the correction term, resulting, at worst, in a slower approach to the correct composition, but introducing no error.

$$\frac{\partial^2 F/RT}{\partial X_i^2} = \frac{1}{Y_i} - \frac{1}{\sum_i Y_i} \quad (2-8)$$

$$\frac{\partial^2 F/RT}{\partial X_i \partial X_k} = - \frac{1}{\sum_i Y_i} \quad i \neq k \quad (2-9)$$

To find the next approximation to the composition  $(X_1, X_2, \dots, X_i)$ ,  $\Phi/RT(X)$  is minimized subject to the mass balance constraints:

$$\sum_{i=1}^N a_{ij} X_i = b_j \quad (j = 1, 2, \dots, M) \quad (2-10)$$

where there are M types of atoms and N species in the mixture and the  $a_{ij}$  are stoichiometric coefficients.  $b_j$  represents the total number of moles of atom type j in the mixture. For an ionized gas, one of these constraints requires electrical neutrality of the gas, with the  $a_{ij}$  being the charge per specie i and  $b_j = 0$ .

To apply the constraints, let

$$G(X) = \Phi/RT(X) + \sum_j \pi_j (- \sum_i a_{ij} X_i + b_j) \quad (2-11)$$

where the  $\pi_j$  are Lagrange multipliers.

To minimize (2-11),

$$\begin{aligned} \frac{\partial G(X)}{\partial X_i} = 0 &= \frac{F_i^0}{RT} + \ln P + \ln \frac{Y_i}{\sum_i Y_i} + \frac{1}{3} \frac{Y_e}{\sum_i Y_i} \frac{e}{RT} \\ &+ \frac{X_i}{Y_i} - \frac{\sum_i X_i}{\sum_i Y_i} - \sum_{j=1}^M \pi_j a_{ij} \quad i \neq i \text{ elec.} \\ &= \frac{F_i^0}{RT} + \ln P + \ln \frac{Y_i}{\sum_i Y_i} + \frac{1}{3} Y_e \left( \frac{1}{\sum_i Y_i} - \frac{1}{Y_e} \right) \frac{e}{RT} \\ &+ \frac{X_i}{Y_i} - \frac{\sum_i X_i}{\sum_i Y_i} - \sum_{j=1}^M \pi_j a_{ij} \quad i=i \text{ elec.} \quad (2-12) \end{aligned}$$

The equations (2-12) are now arranged to express  $X_i$  explicitly and substituted into the constraint equations (2-10) to give M equations in the M+1 unknowns  $\pi_1, \pi_2, \dots, \pi_M$  and  $\sum_i X_i$ . The final necessary equation is obtained by summing the equations (2-12) to give an expression for  $\sum_i X_i$  in terms of the  $\pi_i$ .

With the additional constraint that all compositions must be positive to remain physically meaningful this set of  $M+1$  equations is solved for  $\pi_i$  ( $i=1, \dots, M$ ) and  $\sum X_i$ . These values are then substituted into equations (2-12) to get the  $X_i$ . The  $X_i$  are now called the new  $Y_i$  and the process is repeated to convergence.

Once having computed the composition, the calculation of the other thermodynamic properties is straightforward. The equilibrium heat capacity per original (un-ionized) mole is defined:

$$C_{P_e} = \left( \frac{\partial H}{\partial T} \right)_P = \frac{\partial}{\partial T} \left( \sum_i X_i H_i \right) = \sum_i X_i C_{P_i} + \sum_i \frac{H_i}{RT} \frac{\partial X_i}{\partial T} \quad RT \quad (2-13)$$

where the frozen heat capacity is defined:

$$C_{P_F} = \sum_i X_i C_{P_i} \quad (2-14)$$

For simplicity, the ideal gas heat capacities,  $C_{P_i}$ , were used. The small contribution of the real gas correction to the heat capacity is neglected.

To find  $\gamma$ , and the speed of sound,  $a$ , the following relations were used:

$$C_P - C_V = -T \left( \frac{\partial V}{\partial T} \right)_P^2 \left( \frac{\partial P}{\partial V} \right)_T = RZ \frac{\left[ 1 + \frac{T}{Z} \left( \frac{\partial Z}{\partial T} \right)_P \right]^2}{\left[ 1 - \frac{P}{Z} \left( \frac{\partial Z}{\partial P} \right)_T \right]} \quad (2-15)$$

where  $V = \frac{Z RT}{P}$  = volume per original mole

$$\gamma = \frac{C_P}{C_V} = \frac{1}{1 - \frac{RZ}{C_P} \frac{\left[ 1 + \frac{T}{Z} \left( \frac{\partial Z}{\partial T} \right)_P \right]^2}{\left[ 1 - \frac{P}{Z} \left( \frac{\partial Z}{\partial P} \right)_T \right]}} \quad (2-16)$$



$$a^2 = \gamma \left( \frac{\partial P}{\partial \rho} \right)_T = \frac{\gamma Z RT}{\left[ 1 - \frac{P}{Z} \left( \frac{\partial Z}{\partial P} \right)_T \right]} \quad (2-17)$$

$$\frac{a^2}{a_o^2} = \frac{\gamma T}{\gamma_o T_o} Z \left( \frac{1}{1 - \frac{P}{Z} \left( \frac{\partial Z}{\partial P} \right)_T} \right) \quad (2-18)$$

The frozen values of  $\gamma$  and speed of sound were defined as those evaluated at equilibrium composition, but with  $\frac{\partial Z}{\partial T} = \frac{\partial Z}{\partial P} = 0$ .

The derivatives  $\frac{\partial X_i}{\partial T}$ ,  $\frac{\partial Z}{\partial T}$ ,  $\frac{\partial Z}{\partial P}$  can be found from Equations 2-12, evaluated at equilibrium where  $X_i = Y_i$ :

$$\frac{F_i^o}{RT} + \ln P + \ln \frac{X_i}{\sum_1 X_i} = \sum_{j=1}^M \pi_j a_{ij} \quad i = 1, N \quad (2-19)$$

The real gas correction has been neglected for simplicity. These equations are differentiated with respect to  $T$  to give the set of equations:

$$-\frac{H_i^o}{RT^2} + \frac{1}{X_i} \frac{\partial X_i}{\partial T} + \frac{1}{\sum_1 X_i} \frac{\partial \sum_1 X_i}{\partial T} = \sum_{j=1}^M \frac{\partial \pi_j}{\partial T} a_{ij} \quad i = 1, N \quad (2-20)$$

The mass balance constraints are also differentiated giving:

$$\sum_{i=1}^N a_{ij} \frac{\partial X_i}{\partial T} = 0 \quad j = 1, M \quad (2-21)$$

Substituting  $\frac{\partial x_i}{\partial T}$  from Eq. (2-20) into Eq. (2-21) gives a set of M equations in M+1 unknowns,

$$\frac{\partial \pi_j}{\partial T} \quad (j=1,M), \quad \text{and} \quad \frac{\partial \sum_i x_i}{\partial T}.$$

The final equation is found by summing equations (2-20) over i.  $\frac{\partial x_i}{\partial T}$  is found by substituting  $\frac{\partial \pi_j}{\partial T}$  back into Eq. (2-20).

The equations (2-19) are also differentiated with respect to P, to give the set of equations:

$$\frac{1}{P} + \frac{1}{x_i} \frac{\partial x_i}{\partial P} - \frac{1}{\sum_i x_i} \frac{\partial \sum_i x_i}{\partial P} = \sum_{j=1}^M \frac{\partial \pi_j}{\partial P} a_{ij} \quad i = 1, N \quad (2-22)$$

The mass balance constraints are again differentiated, giving:

$$\sum_{i=1}^N a_{ij} \frac{\partial x_i}{\partial P} = 0 \quad (2-23)$$

Again, a set of M+1 simultaneous equations are obtained and solved for  $\frac{\partial \sum_i x_i}{\partial P}$  (note that  $Z = \sum_i x_i$ )

#### Thermodynamic Data:

The data necessary for the calculation of the equilibrium properties of a gas mixture are the standard entropy, free-energy and heat capacity at constant pressure of each of the species presumed to be present. These values were calculated using electronic energy levels from NBS Circular 467.

**Results:**

The composition, composition derivatives, compressibility, enthalpy, entropy, and equilibrium and frozen heat capacity, gamma and speed of sound were calculated over the temperature range 1,000-25,000<sup>o</sup>K and pressure range .0001 - 100 atm. The results are given in Tables I, II, III, and IV. A Mollier chart is enclosed.

TABLE I

Argon Thermodynamic Properties ( $Z$ ,  $H/RT_0$ ,  $S/R$ ,  $(C_p/R)_e$ ,  $(A/A_0)_{eq.}$ )

$P$  = pressure in atmospheres

$$Z = \sum_i X_i = \frac{MW_0}{MW} ; MW_0 = 39.955 \text{ (physical scale)}$$

$X_i$  = moles of  $i$  per original (undissociated) mole.

$$T_0 = 273.16 \text{ } ^\circ\text{K}$$

$$RT_0 = 542.99 \text{ cal/mol} = 5.6860 \times 10^4 \text{ M}^2/\text{s}^2 = 24.462 \text{ BTU/lb.}$$

$$R = 1.9878 \text{ cal/mol } ^\circ\text{K} = 208.16 \text{ M}^2/\text{s}^2 \text{ } ^\circ\text{K} = .049751 \text{ BTU/lb } ^\circ\text{R}$$

$$C_{pe} = \sum_i (X_i \frac{\partial H_i}{\partial T} + H_i \frac{\partial X_i}{\partial T}) \text{ where } H_i \text{ is based on } 0^\circ\text{K, ideal gas}$$

$A$  = speed of sound

$$A_0 = \sqrt{\gamma_0 RT_0} = 3.078 \text{ M/sec.}$$

$$\gamma_0 = 5/3$$

T=1000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.000E-00	9.152E-00	3.084E+01	2.500E-00	1.913E-00
-3.5	1.000E-00	9.152E-00	2.969E+01	2.500E-00	1.913E-00
-3.0	1.000E-00	9.152E-00	2.854E+01	2.500E-00	1.913E-00
-2.5	1.000E-00	9.152E-00	2.739E+01	2.500E-00	1.913E-00
-2.0	1.000E-00	9.152E-00	2.624E+01	2.500E-00	1.913E-00
-1.5	1.000E-00	9.152E-00	2.508E+01	2.500E-00	1.913E-00
-1.0	1.000E-00	9.152E-00	2.393E+01	2.500E-00	1.913E-00
-.5	1.000E-00	9.152E-00	2.278E+01	2.500E-00	1.913E-00
0.0	1.000E-00	9.152E-00	2.163E+01	2.500E-00	1.913E-00
.5	1.000E-00	9.152E-00	2.048E+01	2.500E-00	1.913E-00
1.0	1.000E-00	9.152E-00	1.933E+01	2.500E-00	1.913E-00
1.5	1.000E-00	9.152E-00	1.818E+01	2.500E-00	1.913E-00
2.0	1.000E-00	9.152E-00	1.702E+01	2.500E-00	1.913E-00

T=2000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.000E-00	1.830E+01	3.257E+01	2.500E-00	2.705E-00
-3.5	1.000E-00	1.830E+01	3.142E+01	2.500E-00	2.705E-00
-3.0	1.000E-00	1.830E+01	3.027E+01	2.500E-00	2.705E-00
-2.5	1.000E-00	1.830E+01	2.912E+01	2.500E-00	2.705E-00
-2.0	1.000E-00	1.830E+01	2.797E+01	2.500E-00	2.705E-00
-1.5	1.000E-00	1.830E+01	2.682E+01	2.500E-00	2.705E-00
-1.0	1.000E-00	1.830E+01	2.567E+01	2.500E-00	2.705E-00
-.5	1.000E-00	1.830E+01	2.451E+01	2.500E-00	2.705E-00
0.0	1.000E-00	1.830E+01	2.336E+01	2.500E-00	2.705E-00
.5	1.000E-00	1.830E+01	2.221E+01	2.500E-00	2.705E-00
1.0	1.000E-00	1.830E+01	2.106E+01	2.500E-00	2.705E-00
1.5	1.000E-00	1.830E+01	1.991E+01	2.500E-00	2.705E-00
2.0	1.000E-00	1.830E+01	1.876E+01	2.500E-00	2.705E-00

T=3000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.000E-00	2.745E+01	3.359E+01	2.500E-00	3.313E-00
-3.5	1.000E-00	2.745E+01	3.244E+01	2.500E-00	3.313E-00
-3.0	1.000E-00	2.745E+01	3.128E+01	2.500E-00	3.313E-00
-2.5	1.000E-00	2.745E+01	3.013E+01	2.500E-00	3.313E-00
-2.0	1.000E-00	2.745E+01	2.898E+01	2.500E-00	3.313E-00
-1.5	1.000E-00	2.745E+01	2.783E+01	2.500E-00	3.313E-00
-1.0	1.000E-00	2.745E+01	2.668E+01	2.500E-00	3.313E-00
-.5	1.000E-00	2.745E+01	2.553E+01	2.500E-00	3.313E-00
0.0	1.000E-00	2.745E+01	2.438E+01	2.500E-00	3.313E-00
.5	1.000E-00	2.745E+01	2.323E+01	2.500E-00	3.313E-00
1.0	1.000E-00	2.745E+01	2.207E+01	2.500E-00	3.313E-00
1.5	1.000E-00	2.745E+01	2.092E+01	2.500E-00	3.313E-00
2.0	1.000E-00	2.745E+01	1.977E+01	2.500E-00	3.313E-00

T=4000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.000E-00	3.660E+01	3.431E+01	2.500E-00	3.825E-00
-3.5	1.000E-00	3.660E+01	3.315E+01	2.500E-00	3.826E-00
-3.0	9.999E-01	3.660E+01	3.200E+01	2.500E-00	3.826E-00
-2.5	1.000E-00	3.660E+01	3.085E+01	2.500E-00	3.826E-00
-2.0	1.000E-00	3.660E+01	2.970E+01	2.500E-00	3.826E-00
-1.5	1.000E-00	3.660E+01	2.855E+01	2.500E-00	3.826E-00
-1.0	1.000E-00	3.660E+01	2.740E+01	2.500E-00	3.826E-00
-.5	1.000E-00	3.660E+01	2.625E+01	2.500E-00	3.826E-00
0.0	1.000E-00	3.660E+01	2.510E+01	2.500E-00	3.826E-00
.5	1.000E-00	3.660E+01	2.394E+01	2.500E-00	3.826E-00
1.0	1.000E-00	3.660E+01	2.279E+01	2.500E-00	3.826E-00
1.5	1.000E-00	3.660E+01	2.164E+01	2.500E-00	3.826E-00
2.0	1.000E-00	3.660E+01	2.049E+01	2.500E-00	3.826E-00

T=5000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.000E-00	4.582E+01	3.487E+01	2.569E-00	4.244E-00
-3.5	1.000E-00	4.579E+01	3.371E+01	2.538E-00	4.259E-00
-3.0	1.000E-00	4.578E+01	3.256E+01	2.521E-00	4.267E-00
-2.5	1.000E-00	4.577E+01	3.141E+01	2.512E-00	4.271E-00
-2.0	1.000E-00	4.576E+01	3.026E+01	2.506E-00	4.274E-00
-1.5	1.000E-00	4.576E+01	2.911E+01	2.503E-00	4.275E-00
-1.0	1.000E-00	4.576E+01	2.796E+01	2.502E-00	4.276E-00
-.5	1.000E-00	4.576E+01	2.680E+01	2.501E-00	4.277E-00
0.0	1.000E-00	4.576E+01	2.565E+01	2.500E-00	4.277E-00
.5	1.000E-00	4.576E+01	2.450E+01	2.500E-00	4.277E-00
1.0	9.999E-01	4.576E+01	2.335E+01	2.500E-00	4.277E-00
1.5	1.000E-00	4.576E+01	2.220E+01	2.500E-00	4.277E-00
2.0	1.000E-00	4.576E+01	2.105E+01	2.500E-00	4.277E-00

T=6000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.002E-00	5.666E+01	3.540E+01	3.824E-00	4.289E-00
-3.5	1.001E-00	5.589E+01	3.422E+01	3.245E-00	4.410E-00
-3.0	1.000E-00	5.546E+01	3.304E+01	2.919E-00	4.507E-00
-2.5	1.000E-00	5.522E+01	3.188E+01	2.736E-00	4.576E-00
-2.0	1.000E-00	5.508E+01	3.072E+01	2.633E-00	4.620E-00
-1.5	1.000E-00	5.501E+01	2.957E+01	2.575E-00	4.648E-00
-1.0	1.000E-00	5.496E+01	2.841E+01	2.542E-00	4.664E-00
-.5	1.000E-00	5.494E+01	2.726E+01	2.523E-00	4.673E-00
0.0	1.000E-00	5.493E+01	2.611E+01	2.513E-00	4.679E-00
.5	1.000E-00	5.492E+01	2.496E+01	2.507E-00	4.682E-00
1.0	1.000E-00	5.491E+01	2.381E+01	2.504E-00	4.683E-00
1.5	1.000E-00	5.491E+01	2.266E+01	2.502E-00	4.684E-00
2.0	1.000E-00	5.491E+01	2.150E+01	2.501E-00	4.685E-00

T=7000° K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.026E-00	8.323E+01	3.651E+01	1.329E+01	4.260E-00
-3.5	1.014E-00	7.487E+01	3.500E+01	8.584E-00	4.322E-00
-3.0	1.008E-00	7.015E+01	3.366E+01	5.930E-00	4.424E-00
-2.5	1.004E-00	6.750E+01	3.239E+01	4.434E-00	4.554E-00
-2.0	1.002E-00	6.600E+01	3.118E+01	3.591E-00	4.690E-00
-1.5	1.001E-00	6.516E+01	2.999E+01	3.116E-00	4.809E-00
-1.0	1.000E-00	6.468E+01	2.882E+01	2.848E-00	4.900E-00
-.5	1.000E-00	6.441E+01	2.766E+01	2.697E-00	4.963E-00
0.0	1.000E-00	6.426E+01	2.650E+01	2.611E-00	5.003E-00
.5	1.000E-00	6.417E+01	2.535E+01	2.563E-00	5.027E-00
1.0	1.000E-00	6.412E+01	2.419E+01	2.536E-00	5.042E-00
1.5	1.000E-00	6.410E+01	2.304E+01	2.520E-00	5.050E-00
2.0	1.000E-00	6.408E+01	2.189E+01	2.511E-00	5.055E-00

T=8000° K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.157E-00	1.902E+02	4.035E+01	5.241E+01	4.734E-00
-3.5	1.089E-00	1.398E+02	3.734E+01	3.138E+01	4.619E-00
-3.0	1.050E-00	1.109E+02	3.513E+01	1.893E+01	4.579E-00
-2.5	1.028E-00	9.454E+01	3.337E+01	1.181E+01	4.599E-00
-2.0	1.016E-00	8.528E+01	3.188E+01	7.768E-00	4.669E-00
-1.5	1.009E-00	8.005E+01	3.053E+01	5.483E-00	4.781E-00
-1.0	1.005E-00	7.709E+01	2.927E+01	4.191E-00	4.918E-00
-.5	1.002E-00	7.542E+01	2.806E+01	3.460E-00	5.055E-00
0.0	1.001E-00	7.447E+01	2.687E+01	3.046E-00	5.172E-00
.5	1.000E-00	7.393E+01	2.570E+01	2.812E-00	5.259E-00
1.0	1.000E-00	7.363E+01	2.454E+01	2.678E-00	5.318E-00
1.5	1.000E-00	7.345E+01	2.338E+01	2.602E-00	5.355E-00
2.0	1.000E-00	7.335E+01	2.223E+01	2.559E-00	5.378E-00



T=9000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.551E-00	4.975E+02	5.017E+01	1.041E+02	5.818E-00
-3.5	1.350E-00	3.459E+02	4.391E+01	8.357E+01	5.431E-00
-3.0	1.206E-00	2.381E+02	3.918E+01	5.469E+01	5.149E-00
-2.5	1.119E-00	1.719E+02	3.583E+01	3.338E+01	4.983E-00
-2.0	1.067E-00	1.333E+02	3.341E+01	2.025E+01	4.910E-00
-1.5	1.038E-00	1.114E+02	3.153E+01	1.262E+01	4.908E-00
-1.0	1.022E-00	9.890E+01	2.997E+01	8.268E-00	4.965E-00
-.5	1.012E-00	9.180E+01	2.859E+01	5.790E-00	5.070E-00
0.0	1.007E-00	8.776E+01	2.730E+01	4.382E-00	5.204E-00
.5	1.004E-00	8.547E+01	2.607E+01	3.580E-00	5.344E-00
1.0	1.002E-00	8.413E+01	2.488E+01	3.123E-00	5.467E-00
1.5	1.001E-00	8.341E+01	2.370E+01	2.862E-00	5.562E-00
2.0	1.000E-00	8.298E+01	2.254E+01	2.712E-00	5.627E-00

T=10,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.901E-00	7.789E+02	5.833E+01	4.128E+01	6.912E-00
-3.5	1.763E-00	6.729E+02	5.333E+01	7.343E+01	6.591E-00
-3.0	1.556E-00	5.152E+02	4.712E+01	8.698E+01	6.177E-00
-2.5	1.355E-00	3.622E+02	4.128E+01	7.051E+01	5.768E-00
-2.0	1.211E-00	2.526E+02	3.682E+01	4.667E+01	5.470E-00
-1.5	1.122E-00	1.848E+02	3.363E+01	2.884E+01	5.295E-00
-1.0	1.070E-00	1.451E+02	3.129E+01	1.777E+01	5.220E-00
-.5	1.040E-00	1.223E+02	2.946E+01	1.129E+01	5.222E-00
0.0	1.023E-00	1.092E+02	2.792E+01	7.562E-00	5.285E-00
.5	1.013E-00	1.017E+02	2.654E+01	5.427E-00	5.394E-00
1.0	1.007E-00	9.751E+01	2.526E+01	4.204E-00	5.529E-00
1.5	1.004E-00	9.504E+01	2.404E+01	3.500E-00	5.665E-00
2.0	1.002E-00	9.362E+01	2.284E+01	3.094E-00	5.781E-00

T=11,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.983E-00	8.593E+02	6.045E+01	1.100E+01	7.906E-00
-3.5	1.950E-00	8.335E+02	5.755E+01	2.174E+01	7.513E-00
-3.0	1.866E-00	7.681E+02	5.374E+01	4.425E+01	7.196E-00
-2.5	1.702E-00	6.413E+02	4.854E+01	6.926E+01	6.821E-00
-2.0	1.491E-00	4.782E+02	4.267E+01	7.163E+01	6.374E-00
-1.5	1.307E-00	3.368E+02	3.757E+01	5.386E+01	5.978E-00
-1.0	1.182E-00	2.408E+02	3.377E+01	3.497E+01	5.709E-00
-.5	1.106E-00	1.824E+02	3.101E+01	2.183E+01	5.564E-00
0.0	1.062E-00	1.482E+02	2.893E+01	1.380E+01	5.514E-00
.5	1.036E-00	1.284E+02	2.723E+01	9.109E-00	5.539E-00
1.0	1.021E-00	1.170E+02	2.577E+01	6.383E-00	5.620E-00
1.5	1.012E-00	1.104E+02	2.444E+01	4.808E-00	5.738E-00
2.0	1.007E-00	1.065E+02	2.318E+01	3.889E-00	5.870E-00

T=12,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	1.997E-00	8.889E+02	6.115E+01	6.831E-00	8.772E-00
-3.5	1.989E-00	8.821E+02	5.871E+01	8.511E-00	8.510E-00
-3.0	1.968E-00	8.647E+02	5.605E+01	1.457E+01	8.072E-00
-2.5	1.910E-00	8.187E+02	5.278E+01	2.934E+01	7.708E-00
-2.0	1.782E-00	7.182E+02	4.839E+01	5.200E+01	7.348E-00
-1.5	1.585E-00	5.642E+02	4.297E+01	6.401E+01	6.902E-00
-1.0	1.385E-00	4.082E+02	3.774E+01	5.443E+01	6.454E-00
-.5	1.235E-00	2.921E+02	3.361E+01	3.753E+01	6.116E-00
0.0	1.140E-00	2.182E+02	3.058E+01	2.406E+01	5.912E-00
.5	1.083E-00	1.740E+02	2.831E+01	1.539E+01	5.820E-00
1.0	1.049E-00	1.481E+02	2.650E+01	1.019E+01	5.812E-00
1.5	1.030E-00	1.328E+02	2.497E+01	7.124E-00	5.869E-00
2.0	1.018E-00	1.240E+02	2.359E+01	5.334E-00	5.966E-00

T=13,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.007E-00	9.190E+02	6.181E+01	1.143E+01	8.547E-00
-3.5	1.999E-00	9.098E+02	5.932E+01	7.754E-00	8.946E-00
-3.0	1.992E-00	9.023E+02	5.687E+01	7.911E-00	8.948E-00
-2.5	1.974E-00	8.874E+02	5.429E+01	1.183E+01	8.563E-00
-2.0	1.927E-00	8.491E+02	5.126E+01	2.251E+01	8.159E-00
-1.5	1.819E-00	7.624E+02	4.731E+01	4.117E+01	7.788E-00
-1.0	1.637E-00	6.185E+02	4.233E+01	5.525E+01	7.344E-00
-.5	1.435E-00	4.592E+02	3.726E+01	5.102E+01	6.872E-00
0.0	1.274E-00	3.326E+02	3.307E+01	3.705E+01	6.492E-00
.5	1.167E-00	2.490E+02	2.994E+01	2.450E+01	6.248E-00
1.0	1.101E-00	1.977E+02	2.759E+01	1.599E+01	6.126E-00
1.5	1.062E-00	1.672E+02	2.572E+01	1.078E+01	6.093E-00
2.0	1.039E-00	1.489E+02	2.414E+01	7.616E-00	6.132E-00

T=14,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.055E-00	9.994E+02	6.342E+01	3.855E+01	8.462E-00
-3.5	2.017E-00	9.505E+02	6.014E+01	1.710E+01	8.649E-00
-3.0	2.003E-00	9.321E+02	5.748E+01	9.576E-00	9.046E-00
-2.5	1.993E-00	9.216E+02	5.499E+01	8.172E-00	9.246E-00
-2.0	1.976E-00	9.060E+02	5.242E+01	1.090E+01	8.966E-00
-1.5	1.932E-00	8.690E+02	4.948E+01	1.956E+01	8.552E-00
-1.0	1.830E-00	7.864E+02	4.574E+01	3.525E+01	8.162E-00
-.5	1.657E-00	6.476E+02	4.107E+01	4.824E+01	7.711E-00
0.0	1.459E-00	4.898E+02	3.625E+01	4.614E+01	7.228E-00
.5	1.296E-00	3.605E+02	3.220E+01	3.466E+01	6.830E-00
1.0	1.185E-00	2.733E+02	2.911E+01	2.361E+01	6.566E-00
1.5	1.116E-00	2.189E+02	2.676E+01	1.591E+01	6.423E-00
2.0	1.074E-00	1.856E+02	2.488E+01	1.096E+01	6.382E-00

T=15,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.231E-00	1.251E+03	6.814E+01	1.022E+02	9.018E-00
-3.5	2.091E-00	1.066E+03	6.231E+01	5.195E+01	8.804E-00
-3.0	2.031E-00	9.864E+02	5.849E+01	2.307E+01	8.871E-00
-2.5	2.007E-00	9.556E+02	5.562E+01	1.173E+01	9.199E-00
-2.0	1.994E-00	9.402E+02	5.306E+01	8.845E-00	9.482E-00
-1.5	1.975E-00	9.217E+02	5.047E+01	1.088E+01	9.294E-00
-1.0	1.928E-00	8.816E+02	4.753E+01	1.862E+01	8.887E-00
-.5	1.824E-00	7.960E+02	4.387E+01	3.228E+01	8.479E-00
0.0	1.654E-00	6.576E+02	3.941E+01	4.302E+01	8.015E-00
.5	1.463E-00	5.035E+02	3.488E+01	4.104E+01	7.529E-00
1.0	1.305E-00	3.780E+02	3.108E+01	3.141E+01	7.129E-00
1.5	1.198E-00	2.916E+02	2.812E+01	2.194E+01	6.871E-00
2.0	1.130E-00	2.378E+02	2.586E+01	1.530E+01	6.726E-00

T=16,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.552E-00	1.698E+03	7.603E+01	1.266E+02	9.976E-00
-3.5	2.297E-00	1.359E+03	6.745E+01	1.065E+02	9.471E-00
-3.0	2.125E-00	1.130E+03	6.102E+01	5.973E+01	9.168E-00
-2.5	2.044E-00	1.022E+03	5.679E+01	2.742E+01	9.153E-00
-2.0	2.012E-00	9.788E+02	5.374E+01	1.351E+01	9.419E-00
-1.5	1.994E-00	9.575E+02	5.110E+01	9.617E-00	9.712E-00
-1.0	1.970E-00	9.341E+02	4.846E+01	1.140E+01	9.566E-00
-.5	1.916E-00	8.871E+02	4.547E+01	1.885E+01	9.169E-00
0.0	1.805E-00	7.935E+02	4.181E+01	3.090E+01	8.744E-00
.5	1.634E-00	6.531E+02	3.752E+01	3.887E+01	8.267E-00
1.0	1.452E-00	5.057E+02	3.332E+01	3.614E+01	7.784E-00
1.5	1.306E-00	3.873E+02	2.980E+01	2.785E+01	7.413E-00
2.0	1.207E-00	3.077E+02	2.708E+01	2.016E+01	7.163E-00

T=17,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.816E-00	2.076E+03	8.230E+01	7.489E+01	1.090E+01
-3.5	2.597E-00	1.782E+03	7.446E+01	1.120E+02	1.041E+01
-3.0	2.337E-00	1.433E+03	6.603E+01	1.026E+02	9.875E-00
-2.5	2.148E-00	1.179E+03	5.939E+01	6.134E+01	9.519E-00
-2.0	2.054E-00	1.052E+03	5.496E+01	2.914E+01	9.458E-00
-1.5	2.014E-00	9.995E+02	5.179E+01	1.447E+01	9.687E-00
-1.0	1.992E-00	9.724E+02	4.909E+01	1.031E+01	9.953E-00
-.5	1.961E-00	9.422E+02	4.638E+01	1.231E+01	9.801E-00
0.0	1.896E-00	8.846E+02	4.331E+01	1.981E+01	9.404E-00
.5	1.773E-00	7.799E+02	3.962E+01	3.016E+01	8.964E-00
1.0	1.602E-00	6.385E+02	3.552E+01	3.510E+01	8.473E-00
1.5	1.435E-00	4.997E+02	3.166E+01	3.153E+01	8.028E-00
2.0	1.305E-00	3.946E+02	2.852E+01	2.459E+01	7.680E-00

T=18,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.936E-00	2.265E+03	8.525E+01	3.345E+01	1.174E+01
-3.5	2.824E-00	2.113E+03	7.964E+01	6.654E+01	1.128E+01
-3.0	2.610E-00	1.824E+03	7.212E+01	1.010E+02	1.077E+01
-2.5	2.350E-00	1.471E+03	6.394E+01	9.503E+01	1.022E+01
-2.0	2.156E-00	1.209E+03	5.739E+01	5.822E+01	9.843E-00
-1.5	2.057E-00	1.074E+03	5.296E+01	2.835E+01	9.770E-00
-1.0	2.013E-00	1.016E+03	4.977E+01	1.455E+01	9.985E-00
-.5	1.986E-00	9.834E+02	4.703E+01	1.094E+01	1.020E+01
0.0	1.946E-00	9.440E+02	4.424E+01	1.357E+01	1.000E+01
.5	1.866E-00	8.724E+02	4.106E+01	2.112E+01	9.600E-00
1.0	1.730E-00	7.567E+02	3.736E+01	2.927E+01	9.137E-00
1.5	1.566E-00	6.171E+02	3.349E+01	3.144E+01	8.673E-00
2.0	1.417E-00	4.934E+02	3.005E+01	2.737E+01	8.255E-00

T=19,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	2.981E-00	2.356E+03	8.660E+01	1.956E+01	1.251E+01
-3.5	2.932E-00	2.287E+03	8.222E+01	3.271E+01	1.208E+01
-3.0	2.816E-00	2.127E+03	7.661E+01	6.328E+01	1.161E+01
-2.5	2.598E-00	1.829E+03	6.923E+01	9.340E+01	1.107E+01
-2.0	2.339E-00	1.477E+03	6.134E+01	8.574E+01	1.051E+01
-1.5	2.150E-00	1.219E+03	5.509E+01	5.212E+01	1.013E+01
-1.0	2.053E-00	1.087E+03	5.082E+01	2.582E+01	1.008E+01
-.5	2.009E-00	1.027E+03	4.768E+01	1.405E+01	1.029E+01
0.0	1.976E-00	9.889E+02	4.490E+01	1.163E+01	1.043E+01
.5	1.923E-00	9.373E+02	4.201E+01	1.516E+01	1.017E+01
1.0	1.825E-00	8.499E+02	3.873E+01	2.228E+01	9.753E-00
1.5	1.684E-00	7.259E+02	3.509E+01	2.793E+01	9.305E-00
2.0	1.531E-00	5.960E+02	3.156E+01	2.769E+01	8.854E-00

T=20,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	3.008E-00	2.428E+03	8.761E+01	2.273E+01	1.271E+01
-3.5	2.978E-00	2.380E+03	8.352E+01	2.071E+01	1.279E+01
-3.0	2.922E-00	2.299E+03	7.903E+01	3.401E+01	1.237E+01
-2.5	2.791E-00	2.119E+03	7.329E+01	6.332E+01	1.188E+01
-2.0	2.562E-00	1.803E+03	6.592E+01	8.748E+01	1.131E+01
-1.5	2.308E-00	1.455E+03	5.839E+01	7.542E+01	1.075E+01
-1.0	2.133E-00	1.214E+03	5.259E+01	4.447E+01	1.041E+01
-.5	2.045E-00	1.092E+03	4.858E+01	2.247E+01	1.039E+01
0.0	2.000E-00	1.033E+03	4.552E+01	1.340E+01	1.060E+01
.5	1.959E-00	9.870E+02	4.270E+01	1.257E+01	1.063E+01
1.0	1.888E-00	9.201E+02	3.971E+01	1.684E+01	1.031E+01
1.5	1.779E-00	8.178E+02	3.637E+01	2.293E+01	9.899E-00
2.0	1.636E-00	6.936E+02	3.292E+01	2.571E+01	9.447E-00

T=21,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	3.054E-00	2.545E+03	8.916E+01	4.458E+01	1.272E+01
-3.5	3.008E-00	2.457E+03	8.454E+01	2.370E+01	1.301E+01
-3.0	2.971E-00	2.398E+03	8.035E+01	2.233E+01	1.305E+01
-2.5	2.902E-00	2.299E+03	7.569E+01	3.701E+01	1.262E+01
-2.0	2.750E-00	2.087E+03	6.970E+01	6.528E+01	1.210E+01
-1.5	2.507E-00	1.749E+03	6.231E+01	8.155E+01	1.150E+01
-1.0	2.265E-00	1.414E+03	5.525E+01	6.428E+01	1.095E+01
-.5	2.109E-00	1.199E+03	4.999E+01	3.646E+01	1.067E+01
0.0	2.031E-00	1.091E+03	4.629E+01	1.915E+01	1.072E+01
.5	1.986E-00	1.032E+03	4.331E+01	1.301E+01	1.089E+01
1.0	1.931E-00	9.750E+02	4.043E+01	1.380E+01	1.079E+01
1.5	1.848E-00	8.920E+02	3.735E+01	1.837E+01	1.044E+01
2.0	1.726E-00	7.804E+02	3.406E+01	2.242E+01	1.001E+01

T=22,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	3.161E-00	2.784E+03	9.219E+01	8.935E+01	1.306E+01
-3.5	3.054E-00	2.573E+03	8.601E+01	4.263E+01	1.306E+01
-3.0	3.004E-00	2.479E+03	8.137E+01	2.390E+01	1.333E+01
-2.5	2.959E-00	2.407E+03	7.707E+01	2.458E+01	1.328E+01
-2.0	2.870E-00	2.280E+03	7.215E+01	4.161E+01	1.282E+01
-1.5	2.690E-00	2.026E+03	6.583E+01	6.765E+01	1.226E+01
-1.0	2.436E-00	1.671E+03	5.852E+01	7.411E+01	1.164E+01
-.5	2.214E-00	1.362E+03	5.206E+01	5.274E+01	1.114E+01
0.0	2.082E-00	1.178E+03	4.739E+01	2.906E+01	1.094E+01
.5	2.015E-00	1.085E+03	4.398E+01	1.646E+01	1.104E+01
1.0	1.963E-00	1.023E+03	4.104E+01	1.312E+01	1.112E+01
1.5	1.898E-00	9.521E+02	3.810E+01	1.522E+01	1.092E+01
2.0	1.797E-00	8.545E+02	3.500E+01	1.900E+01	1.054E+01

T=23,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	3.355E-00	3.199E+03	9.723E+01	1.332E+02	1.372E+01
-3.5	3.150E-00	2.792E+03	8.867E+01	7.972E+01	1.338E+01
-3.0	3.047E-00	2.589E+03	8.271E+01	3.870E+01	1.341E+01
-2.5	2.995E-00	2.493E+03	7.811E+01	2.385E+01	1.364E+01
-2.0	2.938E-00	2.404E+03	7.366E+01	2.789E+01	1.347E+01
-1.5	2.822E-00	2.236E+03	6.838E+01	4.750E+01	1.297E+01
-1.0	2.609E-00	1.936E+03	6.173E+01	6.854E+01	1.237E+01
-.5	2.355E-00	1.578E+03	5.469E+01	6.450E+01	1.174E+01
0.0	2.162E-00	1.307E+03	4.895E+01	4.165E+01	1.132E+01
.5	2.055E-00	1.156E+03	4.483E+01	2.297E+01	1.123E+01
1.0	1.992E-00	1.073E+03	4.164E+01	1.472E+01	1.133E+01
1.5	1.935E-00	1.004E+03	3.873E+01	1.378E+01	1.131E+01
2.0	1.851E-00	9.175E+02	3.575E+01	1.625E+01	1.102E+01

T=24,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	3.590E-00	3.701E+03	1.030E+02	1.316E+02	1.453E+01
-3.5	3.320E-00	3.160E+03	9.294E+01	1.186E+02	1.398E+01
-3.0	3.130E-00	2.780E+03	8.493E+01	6.802E+01	1.368E+01
-2.5	3.036E-00	2.595E+03	7.930E+01	3.403E+01	1.376E+01
-2.0	2.980E-00	2.497E+03	7.474E+01	2.430E+01	1.393E+01
-1.5	2.904E-00	2.381E+03	7.006E+01	3.271E+01	1.362E+01
-1.0	2.752E-00	2.161E+03	6.434E+01	5.366E+01	1.306E+01
-.5	2.512E-00	1.820E+03	5.750E+01	6.610E+01	1.242E+01
0.0	2.272E-00	1.481E+03	5.097E+01	5.323E+01	1.183E+01
.5	2.113E-00	1.256E+03	4.599E+01	3.199E+01	1.153E+01
1.0	2.025E-00	1.133E+03	4.234E+01	1.858E+01	1.151E+01
1.5	1.966E-00	1.054E+03	3.930E+01	1.403E+01	1.159E+01
2.0	1.894E-00	9.725E+02	3.638E+01	1.454E+01	1.143E+01



T=25,000°K

LOGP	Z	H/RT <sub>0</sub>	S/R	(C <sub>p</sub> /R) <sub>e</sub>	(A/A <sub>0</sub> ) <sub>e</sub>
-4.0	3.780E-00	4.115E+03	1.076E+02	9.242E+01	1.533E+01
-3.5	3.534E-00	3.621E+03	9.808E+01	1.262E+02	1.474E+01
-3.0	3.272E-00	3.094E+03	8.842E+01	1.023E+02	1.421E+01
-2.5	3.103E-00	2.756E+03	8.109E+01	5.582E+01	1.399E+01
-2.0	3.019E-00	2.593E+03	7.581E+01	2.984E+01	1.412E+01
-1.5	2.956E-00	2.486E+03	7.123E+01	2.609E+01	1.415E+01
-1.0	2.852E-00	2.329E+03	6.622E+01	3.910E+01	1.371E+01
-.5	2.658E-00	2.049E+03	6.005E+01	5.808E+01	1.310E+01
0.0	2.405E-00	1.689E+03	5.328E+01	5.947E+01	1.244E+01
.5	2.196E-00	1.391E+03	4.748E+01	4.175E+01	1.194E+01
1.0	2.069E-00	1.211E+03	4.320E+01	2.448E+01	1.175E+01
1.5	1.997E-00	1.108E+03	3.990E+01	1.595E+01	1.180E+01
2.0	1.928E-00	1.023E+03	3.694E+01	1.400E+01	1.177E+01

TABLE II

Argon Thermodynamic Properties  $\left( (C_p/R)_F, (A/A_0)_F, \gamma_e, \gamma_F, \left( \frac{\partial \ln Z}{\partial \ln P} \right)_T, \left( \frac{\partial \ln Z}{\partial \ln T} \right)_P \right)$

$P$  = pressure in atmospheres

$$C_{pF} = \sum_i X_i \left( \frac{\partial H_i}{\partial T} \right)_P = \sum_i X_i C_{p_i}$$

$$R = 1.9878 \text{ cal/mol } ^\circ\text{K} = 208.16 \text{ M}^2/\text{s}^2 \text{ } ^\circ\text{K} = .049751 \text{ BTU/lb. } ^\circ\text{R}$$

$A$  = Speed of sound

$$A_0 = \sqrt{\gamma_0 RT_0} = 3.078 \text{ M/sec.}$$

$$\gamma_0 = 5/3$$

$$Z = \sum_i X_i$$

$X_i$  = moles of  $i$  per original (undissociated) mole.

Note: At temperatures below  $6,000^\circ$ , there is some loss of significant figures in the derivatives of  $Z$ , particularly at higher pressures.

T=1000°K						
LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-3.5	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-3.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-2.5	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-2.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-1.5	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-1.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-.5	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
0.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
.5	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.5	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
2.0	2.500E-00	1.913E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99

T=2000°K						
LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-3.5	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-3.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-2.5	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-2.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-1.5	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-1.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-.5	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
0.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
.5	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.5	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
2.0	2.500E-00	2.705E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99

T=3000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-3.5	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-3.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-2.5	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-2.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-1.5	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-1.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
-.5	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
0.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
.5	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.5	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
2.0	2.500E-00	3.313E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99

T=4000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.500E-00	3.826E-00	1.666E-00	1.666E-00	-1.999E-07	1.679E-05
-3.5	2.500E-00	3.826E-00	1.666E-00	1.666E-00	-9.999E-08	9.499E-06
-3.0	2.499E-00	3.826E-00	1.666E-00	1.666E-00	-1.000E-07	5.200E-06
-2.5	2.500E-00	3.826E-00	1.666E-00	1.666E-00	-9.999E-08	3.099E-06
-2.0	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	1.600E-06
-1.5	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	8.000E-07
-1.0	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	5.000E-07
-.5	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	2.000E-07
0.0	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	1.000E-07
.5	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.0	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
1.5	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99
2.0	2.500E-00	3.826E-00	1.666E-00	1.666E-00	0.000E-99	0.000E-99

T=5000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.500E-00	4.278E-00	1.640E-00	1.666E-00	-4.489E-05	1.763E-03
-3.5	2.500E-00	4.278E-00	1.651E-00	1.666E-00	-2.530E-05	9.921E-04
-3.0	2.500E-00	4.277E-00	1.658E-00	1.666E-00	-1.420E-05	5.582E-04
-2.5	2.500E-00	4.277E-00	1.661E-00	1.666E-00	-7.900E-06	3.140E-04
-2.0	2.500E-00	4.277E-00	1.663E-00	1.666E-00	-4.399E-06	1.767E-04
-1.5	2.500E-00	4.277E-00	1.665E-00	1.666E-00	-2.399E-06	9.949E-05
-1.0	2.500E-00	4.277E-00	1.665E-00	1.666E-00	-1.299E-06	5.599E-05
-.5	2.500E-00	4.277E-00	1.666E-00	1.666E-00	-6.999E-07	3.139E-05
0.0	2.500E-00	4.277E-00	1.666E-00	1.666E-00	-3.999E-07	1.769E-05
.5	2.500E-00	4.277E-00	1.666E-00	1.666E-00	-1.999E-07	9.899E-06
1.0	2.499E-00	4.277E-00	1.666E-00	1.666E-00	-1.300E-07	5.500E-06
1.5	2.500E-00	4.277E-00	1.666E-00	1.666E-00	-9.999E-08	3.299E-06
2.0	2.500E-00	4.277E-00	1.666E-00	1.666E-00	0.000E-09	1.800E-06

T=6000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.506E-00	4.691E-00	1.394E-00	1.666E-00	-1.202E-03	3.977E-02
-3.5	2.503E-00	4.689E-00	1.475E-00	1.666E-00	-6.779E-04	2.241E-02
-3.0	2.501E-00	4.688E-00	1.541E-00	1.666E-00	-3.820E-04	1.263E-02
-2.5	2.501E-00	4.687E-00	1.589E-00	1.666E-00	-2.152E-04	7.117E-03
-2.0	2.500E-00	4.686E-00	1.620E-00	1.666E-00	-1.212E-04	4.011E-03
-1.5	2.500E-00	4.686E-00	1.639E-00	1.666E-00	-6.840E-05	2.261E-03
-1.0	2.500E-00	4.686E-00	1.651E-00	1.666E-00	-3.849E-05	1.275E-03
-.5	2.500E-00	4.686E-00	1.657E-00	1.666E-00	-2.169E-05	7.201E-04
0.0	2.500E-00	4.686E-00	1.661E-00	1.666E-00	-1.219E-05	4.065E-04
.5	2.500E-00	4.686E-00	1.663E-00	1.666E-00	-6.899E-06	2.299E-04
1.0	2.500E-00	4.686E-00	1.665E-00	1.666E-00	-3.799E-06	1.301E-04
1.5	2.500E-00	4.686E-00	1.665E-00	1.666E-00	-2.099E-06	7.369E-05
2.0	2.500E-00	4.686E-00	1.666E-00	1.666E-00	-1.199E-06	4.189E-05

T=7000° K

LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.565E-00	5.126E-00	1.165E-00	1.666E-00	-1.269E-02	3.642E-01
-3.5	2.537E-00	5.098E-00	1.206E-00	1.666E-00	-7.241E-03	2.077E-01
-3.0	2.520E-00	5.082E-00	1.268E-00	1.666E-00	-4.109E-03	1.178E-01
-2.5	2.511E-00	5.073E-00	1.346E-00	1.666E-00	-2.327E-03	6.674E-02
-2.0	2.506E-00	5.068E-00	1.429E-00	1.666E-00	-1.316E-03	3.774E-02
-1.5	2.503E-00	5.065E-00	1.503E-00	1.666E-00	-7.447E-04	2.134E-02
-1.0	2.502E-00	5.063E-00	1.561E-00	1.666E-00	-4.215E-04	1.207E-02
-.5	2.501E-00	5.062E-00	1.602E-00	1.666E-00	-2.386E-04	6.840E-03
0.0	2.500E-00	5.062E-00	1.628E-00	1.666E-00	-1.353E-04	3.878E-03
.5	2.500E-00	5.062E-00	1.644E-00	1.666E-00	-7.689E-05	2.203E-03
1.0	2.500E-00	5.061E-00	1.653E-00	1.666E-00	-4.379E-05	1.253E-03
1.5	2.500E-00	5.061E-00	1.659E-00	1.666E-00	-2.489E-05	7.155E-04
2.0	2.500E-00	5.061E-00	1.662E-00	1.666E-00	-1.429E-05	4.097E-04

T=8000° K

LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	2.895E-00	5.819E-00	1.175E-00	1.665E-00	-6.626E-02	1.683E-00
-3.5	2.725E-00	5.647E-00	1.160E-00	1.666E-00	-4.075E-02	1.035E-00
-3.0	2.627E-00	5.545E-00	1.163E-00	1.666E-00	-2.406E-02	6.112E-01
-2.5	2.572E-00	5.487E-00	1.186E-00	1.666E-00	-1.393E-02	3.537E-01
-2.0	2.541E-00	5.454E-00	1.231E-00	1.666E-00	-7.985E-03	2.026E-01
-1.5	2.523E-00	5.435E-00	1.295E-00	1.666E-00	-4.556E-03	1.156E-01
-1.0	2.513E-00	5.424E-00	1.373E-00	1.666E-00	-2.595E-03	6.582E-02
-.5	2.507E-00	5.418E-00	1.452E-00	1.666E-00	-1.479E-03	3.748E-02
0.0	2.504E-00	5.415E-00	1.521E-00	1.666E-00	-8.439E-04	2.137E-02
.5	2.502E-00	5.413E-00	1.573E-00	1.666E-00	-4.826E-04	1.221E-02
1.0	2.501E-00	5.412E-00	1.609E-00	1.666E-00	-2.769E-04	7.000E-03
1.5	2.501E-00	5.411E-00	1.632E-00	1.666E-00	-1.596E-04	4.029E-03
2.0	2.500E-00	5.411E-00	1.646E-00	1.666E-00	-9.249E-05	2.331E-03

T=9000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	3.885E-00	7.144E-00	1.240E-00	1.664E-00	-1.236E-01	2.827E-00
-3.5	3.380E-00	6.665E-00	1.231E-00	1.664E-00	-1.137E-01	2.599E-00
-3.0	3.021E-00	6.302E-00	1.202E-00	1.665E-00	-8.206E-02	1.874E-00
-2.5	2.801E-00	6.068E-00	1.181E-00	1.665E-00	-5.243E-02	1.197E-00
-2.0	2.672E-00	5.928E-00	1.178E-00	1.665E-00	-3.163E-02	7.217E-01
-1.5	2.599E-00	5.846E-00	1.195E-00	1.665E-00	-1.857E-02	4.234E-01
-1.0	2.557E-00	5.800E-00	1.233E-00	1.665E-00	-1.076E-02	2.452E-01
-.5	2.534E-00	5.773E-00	1.292E-00	1.665E-00	-6.208E-03	1.413E-01
0.0	2.520E-00	5.758E-00	1.365E-00	1.665E-00	-3.576E-03	8.130E-02
.5	2.512E-00	5.749E-00	1.442E-00	1.665E-00	-2.064E-03	4.685E-02
1.0	2.508E-00	5.744E-00	1.510E-00	1.665E-00	-1.196E-03	2.709E-02
1.5	2.505E-00	5.741E-00	1.564E-00	1.665E-00	-6.971E-04	1.575E-02
2.0	2.504E-00	5.740E-00	1.601E-00	1.665E-00	-4.095E-04	9.232E-03

T=10,000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	4.763E-00	8.337E-00	1.194E-00	1.664E-00	-4.429E-02	9.222E-01
-3.5	4.417E-00	8.027E-00	1.223E-00	1.664E-00	-9.037E-02	1.880E-00
-3.0	3.902E-00	7.540E-00	1.254E-00	1.663E-00	-1.234E-01	2.566E-00
-2.5	3.401E-00	7.036E-00	1.245E-00	1.662E-00	-1.146E-01	2.381E-00
-2.0	3.041E-00	6.651E-00	1.218E-00	1.662E-00	-8.350E-02	1.733E-00
-1.5	2.819E-00	6.401E-00	1.198E-00	1.661E-00	-5.387E-02	1.117E-00
-1.0	2.688E-00	6.250E-00	1.197E-00	1.661E-00	-3.282E-02	6.800E-01
-.5	2.613E-00	6.162E-00	1.216E-00	1.661E-00	-1.948E-02	4.030E-01
0.0	2.570E-00	6.111E-00	1.257E-00	1.661E-00	-1.143E-02	2.362E-01
.5	2.544E-00	6.082E-00	1.316E-00	1.662E-00	-6.698E-03	1.380E-01
1.0	2.530E-00	6.065E-00	1.386E-00	1.662E-00	-3.932E-03	8.080E-02
1.5	2.521E-00	6.056E-00	1.458E-00	1.662E-00	-2.323E-03	4.758E-02
2.0	2.516E-00	6.050E-00	1.520E-00	1.662E-00	-1.386E-03	2.828E-02

T=11,000° K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	4.566E-00	8.931E-00	1.315E-00	1.664E-00	-8.244E-03	1.583E-01
-3.5	4.885E-00	8.855E-00	1.226E-00	1.664E-00	-2.357E-02	4.513E-01
-3.0	4.678E-00	8.660E-00	1.215E-00	1.663E-00	-5.793E-02	1.108E-00
-2.5	4.275E-00	8.266E-00	1.249E-00	1.661E-00	-1.045E-01	1.997E-00
-2.0	3.755E-00	7.729E-00	1.269E-00	1.658E-00	-1.249E-01	2.385E-00
-1.5	3.301E-00	7.231E-00	1.252E-00	1.655E-00	-1.064E-01	2.029E-00
-1.0	2.994E-00	6.872E-00	1.226E-00	1.652E-00	-7.469E-02	1.421E-00
-.5	2.804E-00	6.645E-00	1.213E-00	1.651E-00	-4.768E-02	9.054E-01
0.0	2.690E-00	6.511E-00	1.219E-00	1.652E-00	-2.917E-02	5.526E-01
.5	2.627E-00	6.430E-00	1.247E-00	1.651E-00	-1.754E-02	3.312E-01
1.0	2.586E-00	6.386E-00	1.293E-00	1.652E-00	-1.050E-02	1.975E-01
1.5	2.564E-00	6.358E-00	1.354E-00	1.652E-00	-6.317E-03	1.183E-01
2.0	2.546E-00	6.346E-00	1.421E-00	1.654E-00	-3.843E-03	7.156E-02

T=12,000° K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	5.000E-00	9.361E-00	1.465E-00	1.665E-00	-2.145E-03	4.318E-02
-3.5	4.982E-00	9.343E-00	1.388E-00	1.664E-00	-5.385E-03	9.723E-02
-3.0	4.931E-00	9.290E-00	1.275E-00	1.664E-00	-1.550E-02	2.754E-01
-2.5	4.794E-00	9.147E-00	1.228E-00	1.662E-00	-4.090E-02	7.249E-01
-2.0	4.490E-00	8.824E-00	1.247E-00	1.658E-00	-8.517E-02	1.506E-00
-1.5	4.020E-00	8.304E-00	1.279E-00	1.651E-00	-1.213E-01	2.143E-00
-1.0	3.538E-00	7.744E-00	1.276E-00	1.643E-00	-1.183E-01	2.085E-00
-.5	3.172E-00	7.303E-00	1.252E-00	1.638E-00	-9.009E-02	1.582E-00
0.0	2.943E-00	7.004E-00	1.233E-00	1.632E-00	-6.039E-02	1.057E-00
.5	2.793E-00	6.829E-00	1.232E-00	1.633E-00	-3.822E-02	6.667E-01
1.0	2.712E-00	6.718E-00	1.250E-00	1.631E-00	-2.365E-02	4.106E-01
1.5	2.648E-00	6.665E-00	1.287E-00	1.636E-00	-1.459E-02	2.518E-01
2.0	2.620E-00	6.626E-00	1.338E-00	1.635E-00	-9.094E-03	1.556E-01



T=13,000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	5.027E-00	9.767E-00	1.280E-00	1.664E-00	-4.550E-03	1.196E-01
-3.5	5.008E-00	9.749E-00	1.405E-00	1.664E-00	-2.697E-03	5.911E-02
-3.0	4.990E-00	9.730E-00	1.414E-00	1.664E-00	-4.604E-03	8.087E-02
-2.5	4.952E-00	9.683E-00	1.316E-00	1.663E-00	-1.250E-02	2.083E-01
-2.0	4.850E-00	9.557E-00	1.250E-00	1.659E-00	-3.355E-02	5.544E-01
-1.5	4.610E-00	9.262E-00	1.254E-00	1.651E-00	-7.404E-02	1.219E-00
-1.0	4.204E-00	8.751E-00	1.287E-00	1.637E-00	-1.155E-01	1.897E-00
-.5	3.737E-00	8.157E-00	1.294E-00	1.623E-00	-1.229E-01	2.012E-00
0.0	3.347E-00	7.664E-00	1.274E-00	1.614E-00	-9.951E-02	1.622E-00
.5	3.102E-00	7.309E-00	1.253E-00	1.603E-00	-6.966E-02	1.130E-00
1.0	2.912E-00	7.112E-00	1.247E-00	1.608E-00	-4.569E-02	7.367E-01
1.5	2.820E-00	6.975E-00	1.260E-00	1.604E-00	-2.929E-02	4.687E-01
2.0	2.703E-00	6.942E-00	1.291E-00	1.624E-00	-1.883E-02	2.984E-01

T=14,000°K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	5.158E-00	1.024E+01	1.161E-00	1.662E-00	-2.493E-02	6.363E-01
-3.5	5.057E-00	1.015E+01	1.217E-00	1.663E-00	-9.395E-03	2.360E-01
-3.0	5.020E-00	1.012E+01	1.334E-00	1.664E-00	-4.298E-03	9.688E-02
-2.5	4.999E-00	1.009E+01	1.401E-00	1.663E-00	-4.939E-03	8.642E-02
-2.0	4.967E-00	1.004E+01	1.338E-00	1.661E-00	-1.199E-02	1.888E-01
-1.5	4.884E-00	9.914E-00	1.270E-00	1.654E-00	-3.168E-02	4.903E-01
-1.0	4.689E-00	9.608E-00	1.266E-00	1.640E-00	-7.036E-02	1.083E-00
-.5	4.336E-00	9.083E-00	1.298E-00	1.618E-00	-1.125E-01	1.726E-00
0.0	3.901E-00	8.467E-00	1.308E-00	1.597E-00	-1.241E-01	1.895E-00
.5	3.496E-00	7.960E-00	1.292E-00	1.589E-00	-1.043E-01	1.583E-00
1.0	3.258E-00	7.571E-00	1.271E-00	1.572E-00	-7.569E-02	1.139E-00
1.5	3.110E-00	7.319E-00	1.263E-00	1.560E-00	-5.154E-02	7.687E-01
2.0	2.886E-00	7.256E-00	1.275E-00	1.593E-00	-3.459E-02	5.099E-01

T=15,000°K

LOGP (C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$	
-4.0	5.641E-00	1.102E+01	1.189E-00	1.654E-00	-7.490E-02	1.801E-00
-3.5	5.261E-00	1.069E+01	1.168E-00	1.659E-00	-3.871E-02	9.293E-01
-3.0	5.098E-00	1.054E+01	1.194E-00	1.662E-00	-1.561E-02	3.708E-01
-2.5	5.037E-00	1.048E+01	1.288E-00	1.662E-00	-6.678E-03	1.469E-01
-2.0	5.011E-00	1.044E+01	1.376E-00	1.661E-00	-6.071E-03	1.048E-01
-1.5	4.983E-00	1.038E+01	1.345E-00	1.656E-00	-1.317E-02	1.967E-01
-1.0	4.918E-00	1.022E+01	1.284E-00	1.645E-00	-3.355E-02	4.877E-01
-.5	4.753E-00	9.877E-00	1.282E-00	1.623E-00	-7.235E-02	1.044E-00
0.0	4.442E-00	9.319E-00	1.312E-00	1.593E-00	-1.130E-01	1.623E-00
.5	4.019E-00	8.705E-00	1.322E-00	1.572E-00	-1.243E-01	1.773E-00
1.0	3.728E-00	8.136E-00	1.307E-00	1.538E-00	-1.061E-01	1.500E-00
1.5	3.303E-00	7.869E-00	1.291E-00	1.569E-00	-7.945E-02	1.111E-00
2.0	3.158E-00	7.613E-00	1.284E-00	1.557E-00	-5.657E-02	7.796E-01

T=16,000°K

LOGP (C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$	
-4.0	6.512E-00	1.214E+01	1.211E-00	1.644E-00	-9.120E-02	2.071E-00
-3.5	5.822E-00	1.154E+01	1.205E-00	1.651E-00	-8.507E-02	1.931E-00
-3.0	5.359E-00	1.112E+01	1.181E-00	1.657E-00	-4.975E-02	1.127E-00
-2.5	5.142E-00	1.092E+01	1.191E-00	1.660E-00	-2.153E-02	4.834E-01
-2.0	5.059E-00	1.083E+01	1.266E-00	1.660E-00	-9.302E-03	1.950E-01
-1.5	5.029E-00	1.077E+01	1.356E-00	1.657E-00	-7.849E-03	1.302E-01
-1.0	5.009E-00	1.068E+01	1.342E-00	1.648E-00	-1.593E-02	2.250E-01
-.5	4.959E-00	1.047E+01	1.296E-00	1.630E-00	-3.868E-02	5.287E-01
0.0	4.816E-00	1.007E+01	1.300E-00	1.599E-00	-7.864E-02	1.065E-00
.5	4.508E-00	9.491E-00	1.328E-00	1.568E-00	-1.160E-01	1.561E-00
1.0	4.254E-00	8.801E-00	1.334E-00	1.518E-00	-1.238E-01	1.649E-00
1.5	3.706E-00	8.422E-00	1.323E-00	1.544E-00	-1.063E-01	1.401E-00
2.0	3.518E-00	8.037E-00	1.308E-00	1.522E-00	-8.226E-02	1.064E-00

T=17,000°K

LOGP (C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$	
-4.0	7.223E-00	1.312E+01	1.190E-00	1.639E-00	-5.174E-02	1.114E-00
-3.5	6.635E-00	1.262E+01	1.215E-00	1.643E-00	-8.753E-02	1.884E-00
-3.0	5.937E-00	1.199E+01	1.217E-00	1.649E-00	-8.938E-02	1.923E-00
-2.5	5.430E-00	1.152E+01	1.193E-00	1.654E-00	-5.640E-02	1.211E-00
-2.0	5.181E-00	1.127E+01	1.196E-00	1.656E-00	-2.576E-02	5.469E-01
-1.5	5.086E-00	1.115E+01	1.262E-00	1.655E-00	-1.165E-02	2.295E-01
-1.0	5.058E-00	1.107E+01	1.345E-00	1.649E-00	-1.028E-02	1.596E-01
-.5	5.049E-00	1.094E+01	1.338E-00	1.635E-00	-2.057E-02	2.731E-01
0.0	5.013E-00	1.067E+01	1.308E-00	1.608E-00	-4.707E-02	6.051E-01
.5	4.856E-00	1.021E+01	1.320E-00	1.575E-00	-8.788E-02	1.119E-00
1.0	4.725E-00	9.512E-00	1.344E-00	1.512E-00	-1.198E-01	1.507E-00
1.5	4.142E-00	9.054E-00	1.350E-00	1.530E-00	-1.229E-01	1.531E-00
2.0	3.938E-00	8.539E-00	1.338E-00	1.495E-00	-1.061E-01	1.295E-00

T=18,000°K

LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	7.539E-00	1.378E+01	1.212E-00	1.637E-00	-2.070E-02	4.269E-01
-3.5	7.243E-00	1.352E+01	1.198E-00	1.639E-00	-4.994E-02	1.023E-00
-3.0	6.674E-00	1.302E+01	1.222E-00	1.642E-00	-8.623E-02	1.765E-00
-2.5	5.982E-00	1.237E+01	1.226E-00	1.647E-00	-9.053E-02	1.851E-00
-2.0	5.469E-00	1.186E+01	1.203E-00	1.650E-00	-5.876E-02	1.198E-00
-1.5	5.213E-00	1.158E+01	1.206E-00	1.651E-00	-2.774E-02	5.567E-01
-1.0	5.121E-00	1.145E+01	1.269E-00	1.648E-00	-1.357E-02	2.473E-01
-.5	5.102E-00	1.133E+01	1.343E-00	1.637E-00	-1.366E-02	1.942E-01
0.0	5.106E-00	1.115E+01	1.336E-00	1.615E-00	-2.764E-02	3.436E-01
.5	5.057E-00	1.081E+01	1.322E-00	1.585E-00	-5.856E-02	7.088E-01
1.0	5.061E-00	1.019E+01	1.341E-00	1.519E-00	-9.872E-02	1.174E-00
1.5	4.544E-00	9.722E-00	1.363E-00	1.526E-00	-1.228E-01	1.452E-00
2.0	4.369E-00	9.106E-00	1.364E-00	1.480E-00	-1.216E-01	1.404E-00

T=19,000°K

LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	7.657E-00	1.427E+01	1.270E-00	1.637E-00	-8.962E-03	1.872E-01
-3.5	7.529E-00	1.415E+01	1.220E-00	1.638E-00	-2.200E-02	4.339E-01
-3.0	7.222E-00	1.387E+01	1.207E-00	1.639E-00	-5.200E-02	1.017E-00
-2.5	6.649E-00	1.333E+01	1.231E-00	1.641E-00	-8.757E-02	1.709E-00
-2.0	5.972E-00	1.266E+01	1.233E-00	1.643E-00	-8.970E-02	1.748E-00
-1.5	5.482E-00	1.215E+01	1.211E-00	1.645E-00	-5.752E-02	1.116E-00
-1.0	5.245E-00	1.186E+01	1.219E-00	1.643E-00	-2.773E-02	5.241E-01
-.5	5.167E-00	1.171E+01	1.284E-00	1.636E-00	-1.539E-02	2.540E-01
0.0	5.165E-00	1.155E+01	1.344E-00	1.619E-00	-1.861E-02	2.399E-01
.5	5.164E-00	1.130E+01	1.339E-00	1.593E-00	-3.766E-02	4.391E-01
1.0	5.258E-00	1.079E+01	1.340E-00	1.531E-00	-7.299E-02	8.238E-01
1.5	4.864E-00	1.037E+01	1.365E-00	1.529E-00	-1.082E-01	1.216E-00
2.0	4.757E-00	9.707E-00	1.379E-00	1.474E-00	-1.246E-01	1.365E-00

T=20,000°K

LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	7.733E-00	1.470E+01	1.234E-00	1.636E-00	-8.478E-03	2.031E-01
-3.5	7.650E-00	1.463E+01	1.265E-00	1.637E-00	-1.064E-02	2.138E-01
-3.0	7.503E-00	1.449E+01	1.224E-00	1.637E-00	-2.535E-02	4.786E-01
-2.5	7.166E-00	1.417E+01	1.218E-00	1.638E-00	-5.746E-02	1.074E-00
-2.0	6.574E-00	1.358E+01	1.241E-00	1.638E-00	-9.064E-02	1.691E-00
-1.5	5.924E-00	1.289E+01	1.238E-00	1.638E-00	-8.682E-02	1.616E-00
-1.0	5.482E-00	1.238E+01	1.219E-00	1.637E-00	-5.348E-02	9.869E-01
-.5	5.283E-00	1.210E+01	1.235E-00	1.631E-00	-2.654E-02	4.675E-01
0.0	5.232E-00	1.192E+01	1.304E-00	1.618E-00	-1.787E-02	2.611E-01
.5	5.235E-00	1.172E+01	1.348E-00	1.597E-00	-2.595E-02	3.046E-01
1.0	5.362E-00	1.131E+01	1.348E-00	1.543E-00	-5.159E-02	5.567E-01
1.5	5.092E-00	1.095E+01	1.363E-00	1.536E-00	-8.688E-02	9.322E-01
2.0	5.068E-00	1.030E+01	1.385E-00	1.476E-00	-1.159E-01	1.208E-00

T=21,000°K						
LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	7.873E-00	1.517E+01	1.171E-00	1.633E-00	-1.900E-02	4.766E-01
-3.5	7.736E-00	1.506E+01	1.233E-00	1.636E-00	-1.001E-02	2.277E-01
-3.0	7.637E-00	1.497E+01	1.259E-00	1.636E-00	-1.323E-02	2.532E-01
-2.5	7.461E-00	1.480E+01	1.227E-00	1.636E-00	-3.103E-02	5.611E-01
-2.0	7.076E-00	1.440E+01	1.231E-00	1.635E-00	-6.586E-02	1.180E-00
-1.5	6.463E-00	1.374E+01	1.251E-00	1.633E-00	-9.378E-02	1.675E-00
-1.0	5.859E-00	1.304E+01	1.242E-00	1.630E-00	-8.141E-02	1.448E-00
-.5	5.488E-00	1.257E+01	1.227E-00	1.624E-00	-4.766E-02	8.334E-01
0.0	5.341E-00	1.229E+01	1.257E-00	1.614E-00	-2.534E-02	4.073E-01
.5	5.311E-00	1.209E+01	1.325E-00	1.597E-00	-2.206E-02	2.818E-01
1.0	5.427E-00	1.176E+01	1.356E-00	1.552E-00	-3.731E-02	3.950E-01
1.5	5.252E-00	1.146E+01	1.364E-00	1.543E-00	-6.627E-02	6.828E-01
2.0	5.295E-00	1.086E+01	1.386E-00	1.483E-00	-1.002E-01	9.961E-01

T=22,000°K						
LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	8.196E-00	1.577E+01	1.166E-00	1.628E-00	-4.289E-02	1.048E-00
-3.5	7.876E-00	1.552E+01	1.179E-00	1.633E-00	-1.974E-02	4.725E-01
-3.0	7.732E-00	1.540E+01	1.238E-00	1.635E-00	-1.153E-02	2.457E-01
-2.5	7.615E-00	1.529E+01	1.255E-00	1.635E-00	-1.715E-02	3.110E-01
-2.0	7.396E-00	1.505E+01	1.232E-00	1.634E-00	-3.959E-02	6.860E-01
-1.5	6.952E-00	1.456E+01	1.246E-00	1.631E-00	-7.630E-02	1.311E-00
-1.0	6.333E-00	1.382E+01	1.260E-00	1.625E-00	-9.482E-02	1.623E-00
-.5	5.803E-00	1.315E+01	1.245E-00	1.616E-00	-7.330E-02	1.244E-00
0.0	5.517E-00	1.271E+01	1.240E-00	1.606E-00	-4.136E-02	6.782E-01
.5	5.417E-00	1.245E+01	1.284E-00	1.592E-00	-2.545E-02	3.624E-01
1.0	5.492E-00	1.215E+01	1.345E-00	1.556E-00	-2.999E-02	3.291E-01
1.5	5.376E-00	1.190E+01	1.367E-00	1.545E-00	-5.021E-02	5.046E-01
2.0	5.456E-00	1.137E+01	1.386E-00	1.491E-00	-8.270E-02	7.868E-01

T=23,000°K

LOGP (C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$	
-4.0	8.771E-00	1.656E+01	1.185E-00	1.619E-00	-6.669E-02	1.572E-00
-3.5	8.167E-00	1.609E+01	1.172E-00	1.628E-00	-4.118E-02	9.664E-01
-3.0	7.867E-00	1.585E+01	1.191E-00	1.632E-00	-1.941E-02	4.410E-01
-2.5	7.722E-00	1.572E+01	1.247E-00	1.633E-00	-1.345E-02	2.651E-01
-2.0	7.580E-00	1.556E+01	1.251E-00	1.633E-00	-2.317E-02	3.977E-01
-1.5	7.303E-00	1.524E+01	1.241E-00	1.629E-00	-5.145E-02	8.551E-01
-1.0	6.802E-00	1.462E+01	1.261E-00	1.622E-00	-8.675E-02	1.432E-00
-.5	6.210E-00	1.384E+01	1.265E-00	1.611E-00	-9.177E-02	1.505E-00
0.0	5.779E-00	1.320E+01	1.249E-00	1.597E-00	-6.328E-02	1.020E-00
.5	5.577E-00	1.282E+01	1.259E-00	1.583E-00	-3.616E-02	5.443E-01
1.0	5.585E-00	1.250E+01	1.314E-00	1.554E-00	-2.913E-02	3.500E-01
1.5	5.494E-00	1.228E+01	1.361E-00	1.543E-00	-3.978E-02	4.026E-01
2.0	5.580E-00	1.183E+01	1.386E-00	1.496E-00	-6.701E-02	6.16CE-01

T=24,000°K

LOGP	(C <sub>p</sub> /R) <sub>F</sub>	(A/A <sub>0</sub> ) <sub>F</sub>	GAMMA <sub>e</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	9.453E-00	1.747E+01	1.189E-00	1.612E-00	-6.579E-02	1.495E-00
-3.5	8.667E-00	1.684E+01	1.189E-00	1.620E-00	-6.428E-02	1.459E-00
-3.0	8.117E-00	1.638E+01	1.178E-00	1.627E-00	-3.765E-02	8.479E-01
-2.5	7.848E-00	1.615E+01	1.206E-00	1.630E-00	-1.862E-02	3.978E-01
-2.0	7.702E-00	1.600E+01	1.255E-00	1.631E-00	-1.653E-02	2.992E-01
-1.5	7.525E-00	1.579E+01	1.251E-00	1.628E-00	-3.233E-02	5.273E-01
-1.0	7.179E-00	1.533E+01	1.255E-00	1.621E-00	-6.617E-02	1.056E-00
-.5	6.644E-00	1.459E+01	1.274E-00	1.608E-00	-9.405E-02	1.491E-00
0.0	6.122E-00	1.380E+01	1.267E-00	1.590E-00	-8.390E-02	1.316E-00
.5	5.802E-00	1.323E+01	1.256E-00	1.573E-00	-5.309E-02	8.044E-01
1.0	5.721E-00	1.285E+01	1.285E-00	1.547E-00	-3.456E-02	4.531E-01
1.5	5.629E-00	1.262E+01	1.342E-00	1.536E-00	-3.497E-02	3.725E-01
2.0	5.691E-00	1.223E+01	1.382E-00	1.498E-00	-5.496E-02	4.972E-01

T=25,000° K

LOGP	$(C_p/R)_F$	$(A/A_0)_F$	GAMMA <sub>0</sub>	GAMMA <sub>F</sub>	$\frac{\partial \ln Z}{\partial \ln P}$	$\frac{\partial \ln Z}{\partial \ln T}$
-4.0	9.987E-00	1.827E+01	1.183E-00	1.608E-00	-4.510E-02	9.914E-01
-3.5	9.285E-00	1.770E+01	1.197E-00	1.614E-00	-6.875E-02	1.508E-00
-3.0	8.535E-00	1.706E+01	1.191E-00	1.621E-00	-5.985E-02	1.309E-00
-2.5	8.056E-00	1.664E+01	1.187E-00	1.626E-00	-3.301E-02	7.111E-01
-2.0	7.825E-00	1.643E+01	1.225E-00	1.628E-00	-1.829E-02	3.611E-01
-1.5	7.672E-00	1.625E+01	1.260E-00	1.626E-00	-2.197E-02	3.658E-01
-1.0	7.445E-00	1.593E+01	1.256E-00	1.621E-00	-4.558E-02	7.095E-01
-.5	7.034E-00	1.531E+01	1.272E-00	1.607E-00	-8.147E-02	1.250E-00
0.0	6.509E-00	1.447E+01	1.283E-00	1.586E-00	-9.499E-02	1.444E-00
.5	6.093E-00	1.373E+01	1.269E-00	1.563E-00	-7.247E-02	1.079E-00
1.0	5.913E-00	1.322E+01	1.272E-00	1.538E-00	-4.581E-02	6.280E-01
1.5	5.795E-00	1.293E+01	1.316E-00	1.525E-00	-3.557E-02	4.093E-01
2.0	5.811E-00	1.258E+01	1.370E-00	1.496E-00	-4.718E-02	4.330E-01

### TABLE III

#### Argon Thermodynamic Properties ( $X_1$ )

$P$  = pressure in atmospheres

$X_1$  = moles of  $i$  per original (undissociated) mole.



T=1000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.000E-00	1.822E-37	0.000E-99	0.000E-99	0.000E-99	1.822E-37
-3.5	1.000E-00	1.024E-37	0.000E-99	0.000E-99	0.000E-99	1.024E-37
-3.0	1.000E-00	5.761E-38	0.000E-99	0.000E-99	0.000E-99	5.761E-38
-2.5	1.000E-00	3.240E-38	0.000E-99	0.000E-99	0.000E-99	3.240E-38
-2.0	1.000E-00	1.822E-38	0.000E-99	0.000E-99	0.000E-99	1.822E-38
-1.5	1.000E-00	1.024E-38	0.000E-99	0.000E-99	0.000E-99	1.024E-38
-1.0	1.000E-00	5.761E-39	0.000E-99	0.000E-99	0.000E-99	5.761E-39
-.5	1.000E-00	3.240E-39	0.000E-99	0.000E-99	0.000E-99	3.240E-39
0.0	1.000E-00	1.822E-39	0.000E-99	0.000E-99	0.000E-99	1.822E-39
.5	1.000E-00	1.024E-39	0.000E-99	0.000E-99	0.000E-99	1.024E-39
1.0	1.000E-00	5.761E-40	0.000E-99	0.000E-99	0.000E-99	5.761E-40
1.5	1.000E-00	3.240E-40	0.000E-99	0.000E-99	0.000E-99	3.240E-40
2.0	1.000E-00	1.822E-40	0.000E-99	0.000E-99	0.000E-99	1.822E-40

T=2000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.000E-00	3.277E-17	4.036E-64	0.000E-99	0.000E-99	3.277E-17
-3.5	1.000E-00	1.842E-17	1.276E-64	0.000E-99	0.000E-99	1.842E-17
-3.0	1.000E-00	1.036E-17	4.036E-65	0.000E-99	0.000E-99	1.036E-17
-2.5	1.000E-00	5.827E-18	1.276E-65	0.000E-99	0.000E-99	5.828E-18
-2.0	1.000E-00	3.277E-18	4.036E-66	0.000E-99	0.000E-99	3.277E-18
-1.5	1.000E-00	1.842E-18	1.276E-66	0.000E-99	0.000E-99	1.842E-18
-1.0	1.000E-00	1.036E-18	4.036E-67	0.000E-99	0.000E-99	1.036E-18
-.5	1.000E-00	5.827E-19	1.276E-67	0.000E-99	0.000E-99	5.828E-19
0.0	1.000E-00	3.277E-19	4.036E-68	0.000E-99	0.000E-99	3.277E-19
.5	1.000E-00	1.842E-19	1.276E-68	0.000E-99	0.000E-99	1.842E-19
1.0	1.000E-00	1.036E-19	4.036E-69	0.000E-99	0.000E-99	1.036E-19
1.5	1.000E-00	5.828E-20	1.276E-69	0.000E-99	0.000E-99	5.828E-20
2.0	1.000E-00	3.277E-20	4.036E-70	0.000E-99	0.000E-99	3.277E-20

T=3000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.000E-00	2.331E-10	1.822E-40	2.622E-93	0.000E-99	2.331E-10
-3.5	1.000E-00	1.310E-10	5.763E-41	4.662E-94	0.000E-99	1.310E-10
-3.0	1.000E-00	7.372E-11	1.822E-41	8.292E-95	0.000E-99	7.372E-11
-2.5	1.000E-00	4.145E-11	5.764E-42	1.474E-95	0.000E-99	4.145E-11
-2.0	1.000E-00	2.331E-11	1.822E-42	2.622E-96	0.000E-99	2.331E-11
-1.5	1.000E-00	1.311E-11	5.764E-43	4.664E-97	0.000E-99	1.311E-11
-0.0	1.000E-00	2.332E-12	1.823E-44	8.888E-98	0.000E-99	2.332E-12
.5	1.000E-00	1.311E-12	5.766E-45	0.000E-99	0.000E-99	1.311E-12
1.0	1.000E-00	7.374E-13	1.823E-45	0.000E-99	0.000E-99	7.374E-13
1.5	1.000E-00	4.147E-13	5.768E-46	0.000E-99	0.000E-99	4.147E-13
2.0	1.000E-00	2.332E-13	1.824E-46	0.000E-99	0.000E-99	2.332E-13

T=4000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.000E-00	6.941E-07	1.520E-28	2.185E-67	0.000E-99	6.941E-07
-3.5	1.000E-00	3.904E-07	4.808E-29	3.888E-68	0.000E-99	3.904E-07
-3.0	9.999E-01	2.195E-07	1.521E-29	6.917E-69	0.000E-99	2.195E-07
-2.5	1.000E-00	1.235E-07	4.812E-30	1.230E-69	0.000E-99	1.235E-07
-2.0	1.000E-00	6.946E-08	1.522E-30	2.190E-70	0.000E-99	6.946E-08
-1.5	1.000E-00	3.907E-08	4.817E-31	3.898E-71	0.000E-99	3.907E-08
-1.0	1.000E-00	2.198E-08	1.524E-31	6.940E-72	0.000E-99	2.198E-08
-.5	1.000E-00	1.236E-08	4.825E-32	1.235E-72	0.000E-99	1.236E-08
0.0	1.000E-00	6.958E-09	1.527E-32	2.201E-73	0.000E-99	6.958E-09
.5	1.000E-00	3.915E-09	4.836E-33	3.921E-74	0.000E-99	3.915E-09
1.0	1.000E-00	2.203E-09	1.531E-33	6.989E-75	0.000E-99	2.203E-09
1.5	1.000E-00	1.240E-09	4.852E-34	1.246E-75	0.000E-99	1.240E-09
2.0	1.000E-00	6.982E-10	1.538E-34	2.224E-76	0.000E-99	6.982E-10

T

T=5000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	9.999E-01	9.003E-05	2.471E-21	9.470E-52	0.000E-99	9.003E-05
-3.5	9.999E-01	5.065E-05	7.821E-22	1.686E-52	0.000E-99	5.065E-05
-3.0	9.999E-01	2.850E-05	2.476E-22	3.004E-53	0.000E-99	2.850E-05
-2.5	9.999E-01	1.604E-05	7.843E-23	5.354E-54	0.000E-99	1.604E-05
-2.0	9.999E-01	9.028E-06	2.484E-23	9.548E-55	0.000E-99	9.028E-06
-1.5	9.999E-01	5.082E-06	7.874E-24	1.703E-55	0.000E-99	5.082E-06
-1.0	9.999E-01	2.862E-06	2.497E-24	3.041E-56	0.000E-99	2.862E-06
-.5	9.999E-01	1.612E-06	7.922E-25	5.435E-57	0.000E-99	1.612E-06
0.0	1.000E-00	9.083E-07	2.515E-25	9.724E-58	0.000E-99	9.083E-07
.5	1.000E-00	5.120E-07	7.991E-26	1.741E-58	0.000E-99	5.120E-07
1.0	9.999E-01	2.887E-07	2.542E-26	3.124E-59	0.000E-99	2.887E-07
1.5	1.000E-00	1.629E-07	8.096E-27	5.616E-60	0.000E-99	1.629E-07
2.0	1.000E-00	9.204E-08	2.582E-27	1.011E-60	0.000E-99	9.204E-08

T=6000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	9.975E-01	2.411E-03	1.745E-16	2.902E-41	2.117E-81	2.411E-03
-3.5	9.986E-01	1.357E-03	5.527E-17	5.169E-42	2.120E-82	1.357E-03
-3.0	9.992E-01	7.647E-04	1.752E-17	9.221E-43	2.129E-83	7.647E-04
-2.5	9.995E-01	4.308E-04	5.558E-18	1.647E-43	2.142E-84	4.308E-04
-2.0	9.997E-01	2.427E-04	1.765E-18	2.947E-44	2.159E-85	2.427E-04
-1.5	9.998E-01	1.368E-04	5.610E-19	5.282E-45	2.181E-86	1.368E-04
-1.0	9.999E-01	7.722E-05	1.785E-19	9.482E-46	2.209E-87	7.722E-05
-.5	9.999E-01	4.359E-05	5.689E-20	1.705E-46	2.243E-88	4.359E-05
0.0	9.999E-01	2.463E-05	1.816E-20	3.076E-47	2.286E-89	2.463E-05
.5	9.999E-01	1.393E-05	5.808E-21	5.564E-48	2.338E-90	1.393E-05
1.0	9.999E-01	7.888E-06	1.862E-21	1.010E-48	2.404E-91	7.888E-06
1.5	9.999E-01	4.473E-06	5.990E-22	1.842E-49	2.487E-92	4.473E-06
2.0	1.000E-00	2.541E-06	1.933E-22	3.380E-50	2.591E-93	2.541E-06

T=7000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	9.739E-01	2.607E-02	5.558E-13	1.041E-33	1.661E-67	2.607E-02
-3.5	9.853E-01	1.469E-02	1.746E-13	1.822E-34	1.620E-68	1.469E-02
-3.0	9.917E-01	8.288E-03	5.516E-14	3.226E-35	1.606E-69	8.288E-03
-2.5	9.953E-01	4.676E-03	1.749E-14	5.751E-36	1.610E-70	4.676E-03
-2.0	9.973E-01	2.639E-03	5.564E-15	1.030E-36	1.625E-71	2.639E-03
-1.5	9.985E-01	1.491E-03	1.774E-15	1.854E-37	1.651E-72	1.491E-03
-1.0	9.991E-01	8.436E-04	5.672E-16	3.352E-38	1.686E-73	8.436E-04
-.5	9.995E-01	4.777E-04	1.818E-16	6.083E-39	1.732E-74	4.777E-04
0.0	9.997E-01	2.709E-04	5.848E-17	1.109E-39	1.791E-75	2.709E-04
.5	9.998E-01	1.539E-04	1.888E-17	2.035E-40	1.867E-76	1.539E-04
1.0	9.999E-01	8.770E-05	6.124E-18	3.759E-41	1.964E-77	8.770E-05
1.5	9.999E-01	5.009E-05	1.998E-18	7.004E-42	2.090E-78	5.009E-05
2.0	9.999E-01	2.871E-05	6.564E-19	1.318E-42	2.256E-79	2.871E-05

T=8000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	8.427E-01	1.572E-01	2.748E-10	6.499E-28	6.734E-57	1.572E-01
-3.5	9.104E-01	8.952E-02	8.245E-11	1.027E-28	5.607E-58	8.952E-02
-3.0	9.493E-01	5.070E-02	2.536E-11	1.716E-29	5.089E-59	5.070E-02
-2.5	9.713E-01	2.868E-02	7.933E-12	2.968E-30	4.866E-60	2.868E-02
-2.0	9.837E-01	1.623E-02	2.509E-12	5.246E-31	4.806E-61	1.623E-02
-1.5	9.908E-01	9.197E-03	7.997E-13	9.406E-32	4.848E-62	9.197E-03
-1.0	9.947E-01	5.219E-03	2.564E-13	1.704E-32	4.965E-63	5.219E-03
-.5	9.970E-01	2.967E-03	8.270E-14	3.118E-33	5.152E-64	2.967E-03
0.0	9.983E-01	1.690E-03	2.682E-14	5.756E-34	5.413E-65	1.690E-03
.5	9.990E-01	9.664E-04	8.757E-15	1.073E-34	5.764E-66	9.664E-04
1.0	9.994E-01	5.544E-04	2.880E-15	2.024E-35	6.235E-67	5.544E-04
1.5	9.996E-01	3.195E-04	9.565E-16	3.873E-36	6.873E-68	3.195E-04
2.0	9.998E-01	1.851E-04	3.212E-16	7.540E-37	7.754E-69	1.851E-04

T=9000 K						
LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	4.487E-01	5.512E-01	4.330E-08	3.873E-23	3.204E-48	5.512E-01
-3.5	6.499E-01	3.500E-01	1.205E-08	4.726E-24	1.714E-49	3.500E-01
-3.0	7.930E-01	2.069E-01	3.453E-09	6.563E-25	1.153E-50	2.069E-01
-2.5	8.809E-01	1.190E-01	1.028E-09	1.011E-25	9.208E-52	1.190E-01
-2.0	9.321E-01	6.787E-02	3.159E-10	1.675E-26	8.217E-53	6.787E-02
-1.5	9.613E-01	3.863E-02	9.928E-11	2.905E-27	7.865E-54	3.863E-02
-1.0	9.779E-01	2.201E-02	3.169E-11	5.195E-28	7.878E-55	2.201E-02
-.5	9.874E-01	1.257E-02	1.024E-11	9.496E-29	8.146E-56	1.257E-02
0.0	9.927E-01	7.205E-03	3.344E-12	1.767E-29	8.639E-57	7.205E-03
.5	9.958E-01	4.146E-03	1.103E-12	3.345E-30	9.382E-58	4.146E-03
1.0	9.976E-01	2.398E-03	3.686E-13	6.452E-31	1.044E-58	2.398E-03
1.5	9.986E-01	1.396E-03	1.248E-13	1.271E-31	1.197E-59	1.396E-03
2.0	9.991E-01	8.199E-04	4.302E-14	2.571E-32	1.421E-60	8.199E-04

T=10,000 K						
LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	9.823E-02	9.017E-01	2.467E-06	4.247E-19	7.633E-41	9.017E-01
-3.5	2.368E-01	7.631E-01	7.330E-07	4.427E-20	2.793E-42	7.631E-01
-3.0	4.434E-01	5.565E-01	2.082E-07	4.899E-21	1.203E-43	5.565E-01
-2.5	6.441E-01	3.558E-01	5.860E-08	6.069E-22	6.563E-45	3.558E-01
-2.0	7.880E-01	2.119E-01	1.699E-08	8.567E-23	4.510E-46	2.119E-01
-1.5	8.771E-01	1.228E-01	5.127E-09	1.346E-23	3.690E-47	1.228E-01
-1.0	9.293E-01	7.064E-02	1.600E-09	2.281E-24	3.394E-48	7.064E-02
-.5	9.593E-01	4.061E-02	5.126E-10	4.069E-25	3.373E-49	4.061E-02
0.0	9.765E-01	2.342E-02	1.675E-10	7.536E-26	3.539E-50	2.342E-02
.5	9.864E-01	1.358E-02	5.574E-11	1.439E-26	3.879E-51	1.358E-02
1.0	9.920E-01	7.927E-03	1.888E-11	2.829E-27	4.426E-52	7.927E-03
1.5	9.953E-01	4.668E-03	6.528E-12	5.741E-28	5.272E-53	4.668E-03
2.0	9.972E-01	2.781E-03	2.313E-12	1.209E-28	6.608E-54	2.781E-03

T=11,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.670E-02	9.832E-01	6.097E-05	9.666E-16	1.146E-34	9.833E-01
-3.5	4.957E-02	9.504E-01	1.919E-05	9.911E-17	3.828E-36	9.504E-01
-3.0	1.337E-01	8.662E-01	5.910E-06	1.031E-17	1.345E-37	8.662E-01
-2.5	2.975E-01	7.024E-01	1.746E-06	1.110E-18	5.281E-39	7.024E-01
-2.0	5.089E-01	4.910E-01	4.992E-07	1.297E-19	2.523E-40	4.910E-01
-1.5	6.924E-01	3.075E-01	1.438E-07	1.721E-20	1.540E-41	3.075E-01
-1.0	8.171E-01	1.827E-01	4.308E-08	2.595E-21	1.170E-42	1.827E-01
-.5	8.932E-01	1.067E-01	1.344E-08	4.330E-22	1.043E-43	1.067E-01
0.0	9.377E-01	6.222E-02	4.349E-09	7.773E-23	1.039E-44	6.222E-02
.5	9.635E-01	3.640E-02	1.448E-09	1.474E-23	1.122E-45	3.640E-02
1.0	9.785E-01	2.146E-02	4.960E-10	2.931E-24	1.295E-46	2.146E-02
1.5	9.872E-01	1.279E-02	1.748E-10	6.104E-25	1.594E-47	1.279E-02
2.0	9.922E-01	7.747E-03	6.373E-11	1.340E-25	2.108E-48	7.747E-03

T=12,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	3.425E-03	9.956E-01	8.750E-04	6.355E-13	1.759E-29	9.974E-01
-3.5	1.060E-02	9.891E-01	2.789E-04	6.504E-14	5.780E-31	9.896E-01
-3.0	3.193E-02	9.679E-01	8.871E-05	6.720E-15	1.940E-32	9.681E-01
-2.5	8.985E-02	9.101E-01	2.786E-05	7.052E-16	6.804E-34	9.101E-01
-2.0	2.177E-01	7.822E-01	8.494E-06	7.625E-17	2.609E-35	7.822E-01
-1.5	4.147E-01	5.852E-01	2.496E-06	8.801E-18	1.182E-36	5.852E-01
-1.0	6.149E-01	3.850E-01	7.289E-07	1.140E-18	6.803E-38	3.850E-01
-.5	7.642E-01	2.357E-01	2.198E-07	1.694E-19	4.978E-39	2.357E-01
0.0	8.594E-01	1.405E-01	6.945E-08	2.837E-20	4.418E-40	1.405E-01
.5	9.165E-01	8.340E-02	2.293E-08	5.213E-21	4.517E-41	8.340E-02
1.0	9.502E-01	4.979E-02	7.886E-09	1.032E-21	5.151E-42	4.979E-02
1.5	9.699E-01	3.009E-02	2.822E-09	2.188E-22	6.466E-43	3.009E-02
2.0	9.814E-01	1.853E-02	1.057E-09	4.988E-23	8.969E-44	1.853E-02

T=13,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	8.683E-04	9.907E-01	8.363E-03	1.580E-10	4.467E-25	1.007E-00
-3.5	2.719E-03	9.945E-01	2.691E-03	1.630E-11	1.477E-26	9.999E-01
-3.0	8.410E-03	9.907E-01	8.633E-04	1.684E-12	4.915E-28	9.924E-01
-2.5	2.537E-02	9.743E-01	2.767E-04	1.759E-13	1.673E-29	9.748E-01
-2.0	7.224E-02	9.276E-01	8.811E-05	1.873E-14	5.959E-31	9.278E-01
-1.5	1.807E-01	8.192E-01	2.746E-05	2.061E-15	2.314E-32	8.193E-01
-1.0	3.623E-01	6.376E-01	8.298E-06	2.417E-16	1.053E-33	6.376E-01
-.5	5.645E-01	4.354E-01	2.483E-06	3.170E-17	6.054E-35	4.354E-01
0.0	7.257E-01	2.742E-01	7.659E-07	4.789E-18	4.479E-36	2.742E-01
.5	8.326E-01	1.673E-01	2.485E-07	8.267E-19	4.113E-37	1.673E-01
1.0	8.982E-01	1.017E-01	8.516E-08	1.595E-19	4.473E-38	1.017E-01
1.5	9.374E-01	6.250E-02	3.079E-08	3.396E-20	5.604E-39	6.250E-02
2.0	9.607E-01	3.921E-02	1.182E-08	7.981E-21	8.058E-40	3.921E-02

T=14,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	2.580E-04	9.444E-01	5.525E-02	1.705E-08	2.516E-21	1.055E-00
-3.5	8.251E-04	9.805E-01	1.862E-02	1.867E-09	8.944E-23	1.017E-00
-3.0	2.585E-03	9.913E-01	6.076E-03	1.965E-10	3.037E-24	1.003E-00
-2.5	7.969E-03	9.900E-01	1.965E-03	2.059E-11	1.030E-25	9.939E-01
-2.0	2.392E-02	9.754E-01	6.354E-04	2.184E-12	3.587E-27	9.767E-01
-1.5	6.774E-02	9.320E-01	2.047E-04	2.375E-13	1.315E-28	9.324E-01
-1.0	1.693E-01	8.306E-01	6.504E-05	2.688E-14	5.307E-30	8.307E-01
-.5	3.421E-01	6.578E-01	2.017E-05	3.266E-15	2.526E-31	6.578E-01
0.0	5.403E-01	4.596E-01	6.235E-06	4.463E-16	1.526E-32	4.596E-01
.5	7.032E-01	2.967E-01	1.995E-06	7.080E-17	1.200E-33	2.967E-01
1.0	8.140E-01	1.859E-01	6.771E-07	1.301E-17	1.194E-34	1.859E-01
1.5	8.832E-01	1.167E-01	2.458E-07	2.732E-18	1.450E-35	1.167E-01
2.0	9.252E-01	7.479E-02	9.627E-08	6.540E-19	2.122E-36	7.479E-02

T=15,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	7.997E-05	7.685E-01	2.314E-01	7.754E-07	3.370E-18	1.231E-00
-3.5	2.802E-04	9.076E-01	9.210E-02	1.040E-07	1.524E-19	1.091E-00
-3.0	9.071E-04	9.668E-01	3.227E-02	1.199E-08	5.779E-21	1.031E-00
-2.5	2.841E-03	9.864E-01	1.071E-02	1.296E-09	2.033E-22	1.007E-00
-2.0	8.706E-03	9.877E-01	3.505E-03	1.384E-10	7.093E-24	9.947E-01
-1.5	2.584E-02	9.730E-01	1.145E-03	1.499E-11	2.548E-25	9.753E-01
-1.0	7.188E-02	9.277E-01	3.739E-04	1.677E-12	9.761E-27	9.284E-01
-.5	1.752E-01	8.245E-01	1.210E-04	1.976E-13	4.186E-28	8.248E-01
0.0	3.455E-01	6.544E-01	3.861E-05	2.535E-14	2.160E-29	6.544E-01
.5	5.368E-01	4.630E-01	1.242E-05	3.711E-15	1.437E-30	4.631E-01
1.0	6.942E-01	3.057E-01	4.190E-06	6.389E-16	1.264E-31	3.057E-01
1.5	8.018E-01	1.981E-01	1.520E-06	1.298E-16	1.438E-32	1.981E-01
2.0	8.699E-01	1.300E-01	6.036E-07	3.117E-17	2.089E-33	1.300E-01

T=16,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	2.062E-05	4.474E-01	5.524E-01	1.461E-05	1.194E-15	1.552E-00
-3.5	9.435E-05	7.023E-01	2.975E-01	2.701E-06	7.571E-17	1.297E-00
-3.0	3.440E-04	8.735E-01	1.261E-01	3.903E-07	3.730E-18	1.125E-00
-2.5	1.125E-03	9.530E-01	4.583E-02	4.723E-08	1.503E-19	1.044E-00
-2.0	3.517E-03	9.809E-01	1.551E-02	5.258E-09	5.504E-21	1.012E-00
-1.5	1.066E-02	9.841E-01	5.140E-03	5.753E-10	1.988E-22	9.944E-01
-1.0	3.109E-02	9.672E-01	1.701E-03	6.411E-11	7.461E-24	9.706E-01
-.5	8.378E-02	9.156E-01	5.642E-04	7.452E-12	3.039E-25	9.167E-01
0.0	1.951E-01	8.046E-01	1.866E-04	9.273E-13	1.423E-26	8.050E-01
.5	3.657E-01	6.341E-01	6.164E-05	1.284E-13	8.261E-28	6.342E-01
1.0	5.479E-01	4.520E-01	2.091E-05	2.073E-14	6.348E-29	4.521E-01
1.5	6.930E-01	3.069E-01	7.591E-06	4.022E-15	6.583E-30	3.069E-01
2.0	7.923E-01	2.076E-01	3.037E-06	9.520E-16	9.215E-31	2.076E-01



T=17,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	4.018E-06	1.834E-01	8.163E-01	1.390E-04	1.563E-13	1.816E-00
-3.5	2.638E-05	4.022E-01	5.977E-01	3.399E-05	1.276E-14	1.597E-00
-3.0	1.263E-04	6.620E-01	3.378E-01	6.597E-06	8.504E-16	1.337E-00
-2.5	4.712E-04	8.504E-01	1.490E-01	9.999E-07	4.428E-17	1.148E-00
-2.0	1.547E-03	9.428E-01	5.562E-02	1.256E-07	1.872E-18	1.054E-00
-1.5	4.801E-03	9.760E-01	1.915E-02	1.439E-08	7.136E-20	1.014E-00
-1.0	1.433E-02	9.792E-01	6.439E-03	1.620E-09	2.692E-21	9.921E-01
-.5	4.054E-02	9.572E-01	2.165E-03	1.874E-10	1.071E-22	9.616E-01
0.0	1.042E-01	8.950E-01	7.327E-04	2.296E-11	4.749E-24	8.965E-01
.5	2.269E-01	7.727E-01	2.493E-04	3.078E-12	2.509E-25	7.732E-01
1.0	3.980E-01	6.018E-01	8.622E-05	4.728E-13	1.711E-26	6.020E-01
1.5	5.649E-01	4.350E-01	3.148E-05	8.724E-14	1.595E-27	4.351E-01
2.0	6.942E-01	3.057E-01	1.265E-05	2.004E-14	2.096E-28	3.057E-01

T=18,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	7.141E-07	6.464E-02	9.344E-01	8.676E-04	1.039E-11	1.936E-00
-3.5	5.965E-06	1.754E-01	8.242E-01	2.486E-04	9.682E-13	1.824E-00
-3.0	3.949E-05	3.890E-01	6.108E-01	6.160E-05	8.018E-14	1.610E-00
-2.5	1.904E-04	6.489E-01	3.508E-01	1.218E-05	5.458E-15	1.350E-00
-2.0	7.116E-04	8.419E-01	1.573E-01	1.887E-06	2.923E-16	1.156E-00
-1.5	2.320E-03	9.381E-01	5.956E-02	2.429E-07	1.278E-17	1.057E-00
-1.0	7.092E-03	9.721E-01	2.080E-02	2.860E-08	5.074E-19	1.013E-00
-.5	2.059E-02	9.722E-01	7.108E-03	3.337E-09	2.022E-20	9.865E-01
0.0	5.583E-02	9.417E-01	2.438E-03	4.057E-10	8.709E-22	9.466E-01
.5	1.341E-01	8.649E-01	8.475E-04	5.334E-11	4.332E-23	8.666E-01
1.0	2.699E-01	7.297E-01	2.998E-04	7.914E-12	2.695E-24	7.303E-01
1.5	4.333E-01	5.665E-01	1.109E-04	1.395E-12	2.266E-25	5.667E-01
2.0	5.826E-01	4.173E-01	4.478E-05	3.087E-13	2.746E-26	4.173E-01

T=19,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.376E-07	2.298E-02	9.727E-01	4.207E-03	4.261E-10	1.981E-00
-3.5	1.278E-06	6.850E-02	9.302E-01	1.290E-03	4.195E-11	1.932E-00
-3.0	1.051E-05	1.841E-01	8.154E-01	3.690E-04	3.910E-12	1.816E-00
-2.5	6.779E-05	4.019E-01	5.978E-01	9.088E-05	3.235E-13	1.598E-00
-2.0	3.190E-04	6.598E-01	3.397E-01	1.787E-05	2.203E-14	1.339E-00
-1.5	1.167E-03	8.471E-01	1.517E-01	2.776E-06	1.189E-15	1.150E-00
-1.0	3.734E-03	9.385E-01	5.768E-02	3.622E-07	5.328E-17	1.053E-00
-.5	1.109E-02	9.685E-01	2.039E-02	4.389E-08	2.212E-18	1.009E-00
0.0	3.097E-02	9.619E-01	7.103E-03	5.360E-09	9.473E-20	9.761E-01
.5	7.887E-02	9.186E-01	2.502E-03	6.965E-10	4.540E-21	9.236E-01
1.0	1.758E-01	8.232E-01	9.013E-04	1.008E-10	2.642E-22	8.250E-01
1.5	3.155E-01	6.840E-01	3.387E-04	1.714E-11	2.032E-23	6.847E-01
2.0	4.686E-01	5.312E-01	1.375E-04	3.640E-12	2.256E-24	5.314E-01

T=20,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	3.039E-08	8.675E-03	9.743E-01	1.700E-02	1.184E-08	2.008E-00
-3.5	2.954E-07	2.695E-02	9.676E-01	5.399E-03	1.202E-09	1.978E-00
-3.0	2.692E-06	7.946E-02	9.188E-01	1.651E-03	1.184E-10	1.922E-00
-2.5	2.128E-05	2.084E-01	7.910E-01	4.664E-04	1.097E-11	1.791E-00
-2.0	1.302E-04	4.373E-01	5.623E-01	1.123E-04	8.963E-13	1.562E-00
-1.5	5.806E-04	6.898E-01	3.095E-01	2.158E-05	6.008E-14	1.308E-00
-1.0	2.044E-03	8.624E-01	1.355E-01	3.311E-06	3.227E-15	1.133E-00
-.5	6.300E-03	9.422E-01	5.143E-02	4.364E-07	1.477E-16	1.045E-00
0.0	1.798E-02	9.635E-01	1.842E-02	5.477E-08	6.497E-18	1.000E-00
.5	4.734E-02	9.460E-01	6.577E-03	7.107E-09	3.065E-19	9.592E-01
1.0	1.134E-01	8.842E-01	2.398E-03	1.011E-09	1.702E-20	8.889E-01
1.5	2.218E-01	7.771E-01	9.137E-04	1.669E-10	1.217E-21	7.790E-01
2.0	3.635E-01	6.361E-01	3.736E-04	3.411E-11	1.242E-22	6.368E-01

T=21,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	7.611E-09	3.445E-03	9.384E-01	5.812E-02	2.320E-07	2.054E-00
-3.5	7.662E-08	1.111E-02	9.696E-01	1.924E-02	2.461E-08	2.008E-00
-3.0	7.327E-07	3.428E-02	9.596E-01	6.107E-03	2.505E-09	1.971E-00
-2.5	6.441E-06	9.918E-02	8.989E-01	1.852E-03	2.461E-10	1.902E-00
-2.0	4.814E-05	2.497E-01	7.497E-01	5.119E-04	2.252E-11	1.750E-00
-1.5	2.713E-04	4.923E-01	5.072E-01	1.188E-04	1.794E-12	1.507E-00
-1.0	1.122E-03	7.327E-01	2.661E-01	2.198E-05	1.170E-13	1.265E-00
-0.5	3.716E-03	8.829E-01	1.133E-01	3.309E-06	6.227E-15	1.109E-00
0.0	1.091E-02	9.461E-01	4.290E-02	4.424E-07	2.940E-16	1.031E-00
0.5	2.937E-02	9.549E-01	1.565E-02	5.832E-08	1.401E-17	9.862E-01
1.0	7.397E-02	9.202E-01	5.770E-03	8.227E-09	7.561E-19	9.317E-01
1.5	1.535E-01	8.441E-01	2.219E-03	1.326E-09	5.111E-20	8.486E-01
2.0	2.748E-01	7.242E-01	9.128E-04	2.616E-10	4.834E-21	7.260E-01

T=22,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	2.063E-09	1.376E-03	8.354E-01	1.631E-01	3.168E-06	2.161E-00
-3.5	2.214E-08	4.773E-03	9.361E-01	5.907E-02	3.706E-07	2.054E-00
-3.0	2.195E-07	1.532E-02	9.651E-01	1.956E-02	3.943E-08	2.004E-00
-2.5	2.031E-06	4.666E-02	9.471E-01	6.185E-03	4.016E-09	1.959E-00
-2.0	1.706E-05	1.308E-01	8.672E-01	1.849E-03	3.920E-10	1.870E-00
-1.5	1.172E-04	3.099E-01	6.894E-01	4.935E-04	3.513E-11	1.690E-00
-1.0	5.947E-04	5.628E-01	4.364E-01	1.089E-04	2.701E-12	1.436E-00
-0.5	2.222E-03	7.815E-01	2.162E-01	1.925E-05	1.704E-13	1.214E-00
0.0	6.865E-03	9.036E-01	8.952E-02	2.854E-06	9.047E-15	1.082E-00
0.5	1.886E-02	9.471E-01	3.398E-02	3.924E-07	4.505E-16	1.015E-00
1.0	4.939E-02	9.378E-01	1.272E-02	5.556E-08	2.412E-17	9.633E-01
1.5	1.063E-01	8.887E-01	4.932E-03	8.809E-09	1.564E-18	8.985E-01
2.0	2.049E-01	7.929E-01	2.037E-03	1.684E-09	1.384E-19	7.970E-01

T=23,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	5.581E-10	5.131E-04	6.430E-01	3.563E-01	2.911E-05	2.355E-00
-3.5	6.868E-09	2.063E-03	8.449E-01	1.530E-01	4.084E-06	2.150E-00
-3.0	7.209E-08	7.078E-03	9.379E-01	5.496E-02	4.747E-07	2.047E-00
-2.5	6.910E-07	2.246E-02	9.594E-01	1.811E-02	5.043E-08	1.995E-00
-2.0	6.175E-06	6.697E-02	9.273E-01	5.677E-03	5.124E-09	1.938E-00
-1.5	4.832E-05	1.791E-01	8.191E-01	1.656E-03	4.939E-10	1.822E-00
-1.0	2.973E-04	3.898E-01	6.094E-01	4.213E-04	4.293E-11	1.609E-00
-.5	1.308E-03	6.421E-01	3.564E-01	8.747E-05	3.164E-12	1.355E-00
0.0	4.404E-03	8.290E-01	1.665E-01	1.479E-05	1.937E-13	1.162E-00
.5	1.248E-02	9.200E-01	6.749E-02	2.189E-06	1.047E-14	1.055E-00
1.0	3.390E-02	9.401E-01	2.596E-02	3.170E-07	5.707E-16	9.920E-01
1.5	7.440E-02	9.154E-01	1.016E-02	4.987E-08	3.608E-17	9.357E-01
2.0	1.524E-01	8.433E-01	4.210E-03	9.293E-09	3.023E-18	8.517E-01

T=24,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	1.390E-10	1.676E-04	4.088E-01	5.907E-01	1.802E-04	2.590E-00
-3.5	2.143E-09	8.475E-04	6.778E-01	3.212E-01	3.213E-05	2.320E-00
-3.0	2.522E-08	3.300E-03	8.629E-01	1.336E-01	4.372E-06	2.130E-00
-2.5	2.536E-07	1.111E-02	9.416E-01	4.727E-02	5.010E-07	2.036E-00
-2.0	2.357E-06	3.462E-02	9.499E-01	1.544E-02	5.298E-08	1.980E-00
-1.5	1.990E-05	9.974E-02	8.954E-01	4.763E-03	5.349E-09	1.904E-00
-1.0	1.416E-04	2.486E-01	7.498E-01	1.339E-03	5.052E-10	1.752E-00
-.5	7.421E-04	4.863E-01	5.125E-01	3.201E-04	4.220E-11	1.512E-00
0.0	2.824E-03	7.216E-01	2.755E-01	6.232E-05	2.976E-12	1.272E-00
.5	8.446E-03	8.691E-01	1.223E-01	1.020E-05	1.796E-13	1.113E-00
1.0	2.388E-02	9.269E-01	4.920E-02	1.547E-06	1.027E-14	1.025E-00
1.5	5.290E-02	9.275E-01	1.956E-02	2.446E-07	6.454E-16	9.666E-01
2.0	1.139E-01	8.778E-01	8.139E-03	4.470E-08	5.183E-17	8.941E-01

T=25,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	3.174E-11	4.856E-05	2.206E-01	7.784E-01	8.056E-04	2.780E-00
-3.5	6.305E-10	3.142E-04	4.651E-01	5.344E-01	1.801E-04	2.534E-00
-3.0	8.968E-09	1.490E-03	7.247E-01	2.736E-01	3.031E-05	2.272E-00
-2.5	9.857E-08	5.565E-03	8.851E-01	1.092E-01	3.958E-06	2.103E-00
-2.0	9.755E-07	1.826E-02	9.438E-01	3.785E-02	4.455E-07	2.019E-00
-1.5	8.460E-06	5.534E-02	9.324E-01	1.219E-02	4.678E-08	1.956E-00
-1.0	6.622E-05	1.511E-01	8.450E-01	3.667E-03	4.668E-09	1.852E-00
-.5	4.031E-04	3.420E-01	6.565E-01	9.785E-04	4.278E-10	1.658E-00
0.0	1.775E-03	5.909E-01	4.070E-01	2.176E-04	3.414E-11	1.405E-00
.5	5.760E-03	7.921E-01	2.020E-01	4.002E-05	2.326E-12	1.196E-00
1.0	1.719E-02	8.961E-01	8.666E-02	6.506E-06	1.433E-13	1.069E-00
1.5	3.827E-02	9.263E-01	3.541E-02	1.051E-06	9.153E-15	9.971E-01
2.0	8.610E-02	8.990E-01	1.484E-02	1.901E-07	7.146E-16	9.287E-01

TABLE IV

Argon Thermodynamic Properties  $\left( \left( \frac{\partial \ln X_1}{\partial \ln T} \right)_P \right)$

$P$  = pressure in atmospheres

$X_1$  = moles of i per original (undissociated) mole

Note: At temperatures below 6,000°K, there is some loss in significant figures in the results for argon, particularly at higher pressures.

T=1000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-3.5	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-3.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-2.5	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-2.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-1.5	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-1.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
-.5	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
0.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
.5	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
1.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
1.5	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01
2.0	0.000E-99	9.275E+01	3.231E+02	7.074E+02	1.312E+03	9.275E+01

T=2000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-3.5	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-3.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-2.5	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-2.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-1.5	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-1.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
-.5	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
0.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
.5	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
1.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
1.5	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01
2.0	0.000E-99	4.704E+01	1.628E+02	3.554E+02	6.586E+02	4.704E+01

T=3000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	0.000E-99	3.180E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-3.5	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-3.0	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-2.5	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-2.0	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-1.5	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-1.0	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
-.5	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
0.0	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
.5	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
1.0	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
1.5	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01
2.0	0.000E-99	3.179E+01	1.094E+02	2.381E+02	4.407E+02	3.179E+01

T=4000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.680E-05	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-3.5	-9.400E-06	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-3.0	-5.299E-06	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-2.5	-2.700E-06	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-2.0	-1.800E-06	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-1.5	-1.000E-06	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-1.0	-5.000E-07	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
-.5	-3.000E-07	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
0.0	-2.000E-07	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
.5	-1.000E-07	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
1.0	-1.000E-07	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
1.5	0.000E-99	2.416E+01	8.269E+01	1.795E+02	3.318E+02	2.416E+01
2.0	0.000E-99	2.416E+01	8.268E+01	1.795E+02	3.318E+02	2.416E+01



T=5000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.763E-03	1.958E+01	6.668E+01	1.444E+02	2.664E+02	1.958E+01
-3.5	-9.921E-04	1.958E+01	6.668E+01	1.444E+02	2.664E+02	1.958E+01
-3.0	-5.582E-04	1.958E+01	6.668E+01	1.444E+02	2.664E+02	1.958E+01
-2.5	-3.143E-04	1.958E+01	6.668E+01	1.444E+02	2.664E+02	1.958E+01
-2.0	-1.768E-04	1.958E+01	6.667E+01	1.444E+02	2.664E+02	1.958E+01
-1.5	-9.960E-05	1.958E+01	6.667E+01	1.443E+02	2.664E+02	1.958E+01
-1.0	-5.610E-05	1.958E+01	6.667E+01	1.443E+02	2.664E+02	1.958E+01
-.5	-3.160E-05	1.958E+01	6.667E+01	1.443E+02	2.664E+02	1.958E+01
0.0	-1.770E-05	1.958E+01	6.666E+01	1.443E+02	2.664E+02	1.958E+01
.5	-1.000E-05	1.957E+01	6.666E+01	1.443E+02	2.664E+02	1.957E+01
1.0	-5.799E-06	1.957E+01	6.666E+01	1.443E+02	2.664E+02	1.957E+01
1.5	-3.000E-06	1.957E+01	6.665E+01	1.443E+02	2.664E+02	1.957E+01
2.0	-2.000E-06	1.957E+01	6.664E+01	1.443E+02	2.664E+02	1.957E+01

T=6000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.996E-02	1.653E+01	5.605E+01	1.210E+02	2.230E+02	1.653E+01
-3.5	-2.247E-02	1.653E+01	5.603E+01	1.210E+02	2.229E+02	1.653E+01
-3.0	-1.265E-02	1.652E+01	5.602E+01	1.210E+02	2.229E+02	1.652E+01
-2.5	-7.123E-03	1.652E+01	5.601E+01	1.210E+02	2.229E+02	1.652E+01
-2.0	-4.013E-03	1.652E+01	5.600E+01	1.209E+02	2.229E+02	1.652E+01
-1.5	-2.262E-03	1.652E+01	5.600E+01	1.209E+02	2.228E+02	1.652E+01
-1.0	-1.276E-03	1.652E+01	5.599E+01	1.209E+02	2.228E+02	1.652E+01
-.5	-7.202E-04	1.651E+01	5.598E+01	1.209E+02	2.228E+02	1.651E+01
0.0	-4.068E-04	1.651E+01	5.598E+01	1.209E+02	2.228E+02	1.651E+01
.5	-2.299E-04	1.651E+01	5.597E+01	1.209E+02	2.228E+02	1.651E+01
1.0	-1.302E-04	1.650E+01	5.596E+01	1.209E+02	2.228E+02	1.650E+01
1.5	-7.390E-05	1.649E+01	5.594E+01	1.209E+02	2.227E+02	1.649E+01
2.0	-4.190E-05	1.649E+01	5.593E+01	1.208E+02	2.227E+02	1.649E+01

T=7000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.838E-01	1.433E+01	4.875E+01	1.050E+02	1.929E+02	1.433E+01
-3.5	-2.139E-01	1.434E+01	4.859E+01	1.047E+02	1.924E+02	1.434E+01
-3.0	-1.198E-01	1.434E+01	4.850E+01	1.045E+02	1.921E+02	1.434E+01
-2.5	-6.736E-02	1.433E+01	4.844E+01	1.044E+02	1.919E+02	1.433E+01
-2.0	-3.794E-02	1.433E+01	4.841E+01	1.043E+02	1.918E+02	1.433E+01
-1.5	-2.141E-02	1.433E+01	4.839E+01	1.043E+02	1.918E+02	1.433E+01
-1.0	-1.209E-02	1.432E+01	4.837E+01	1.042E+02	1.917E+02	1.432E+01
-.5	-6.846E-03	1.432E+01	4.835E+01	1.042E+02	1.917E+02	1.432E+01
0.0	-3.880E-03	1.431E+01	4.834E+01	1.042E+02	1.916E+02	1.431E+01
.5	-2.203E-03	1.430E+01	4.832E+01	1.042E+02	1.916E+02	1.430E+01
1.0	-1.254E-03	1.429E+01	4.830E+01	1.041E+02	1.916E+02	1.429E+01
1.5	-7.158E-04	1.428E+01	4.827E+01	1.041E+02	1.915E+02	1.428E+01
2.0	-4.098E-04	1.427E+01	4.825E+01	1.040E+02	1.915E+02	1.427E+01

T=8000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-2.312E-00	1.239E+01	4.436E+01	9.549E+01	1.741E+02	1.239E+01
-3.5	-1.238E-00	1.260E+01	4.371E+01	9.397E+01	1.717E+02	1.260E+01
-3.0	-6.765E-01	1.266E+01	4.328E+01	9.305E+01	1.703E+02	1.266E+01
-2.5	-3.745E-01	1.268E+01	4.301E+01	9.250E+01	1.695E+02	1.268E+01
-2.0	-2.093E-01	1.268E+01	4.285E+01	9.217E+01	1.690E+02	1.268E+01
-1.5	-1.177E-01	1.268E+01	4.275E+01	9.198E+01	1.687E+02	1.268E+01
-1.0	-6.651E-02	1.267E+01	4.269E+01	9.186E+01	1.685E+02	1.267E+01
-.5	-3.770E-02	1.267E+01	4.264E+01	9.178E+01	1.684E+02	1.267E+01
0.0	-2.144E-02	1.266E+01	4.261E+01	9.172E+01	1.683E+02	1.266E+01
.5	-1.223E-02	1.264E+01	4.257E+01	9.166E+01	1.682E+02	1.264E+01
1.0	-7.008E-03	1.263E+01	4.254E+01	9.161E+01	1.681E+02	1.263E+01
1.5	-4.031E-03	1.261E+01	4.250E+01	9.155E+01	1.681E+02	1.261E+01
2.0	-2.332E-03	1.259E+01	4.245E+01	9.147E+01	1.680E+02	1.259E+01

T=9000 K						
LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-9.774E-00	7.956E-00	4.106E+01	9.124E+01	1.657E+02	7.956E-00
-3.5	-5.399E-00	1.002E+01	4.083E+01	8.870E+01	1.608E+02	1.002E+01
-3.0	-2.852E-00	1.093E+01	4.009E+01	8.632E+01	1.568E+02	1.093E+01
-2.5	-1.520E-00	1.125E+01	3.940E+01	8.462E+01	1.541E+02	1.125E+01
-2.0	-8.268E-01	1.135E+01	3.891E+01	8.354E+01	1.524E+02	1.135E+01
-1.5	-4.575E-01	1.138E+01	3.860E+01	8.289E+01	1.514E+02	1.138E+01
-1.0	-2.563E-01	1.138E+01	3.840E+01	8.249E+01	1.509E+02	1.138E+01
-.5	-1.449E-01	1.137E+01	3.828E+01	8.225E+01	1.505E+02	1.137E+01
0.0	-8.248E-02	1.136E+01	3.819E+01	8.208E+01	1.502E+02	1.136E+01
.5	-4.724E-02	1.134E+01	3.812E+01	8.196E+01	1.501E+02	1.134E+01
1.0	-2.722E-02	1.132E+01	3.806E+01	8.186E+01	1.499E+02	1.132E+01
1.5	-1.580E-02	1.130E+01	3.799E+01	8.176E+01	1.498E+02	1.130E+01
2.0	-9.247E-03	1.126E+01	3.792E+01	8.165E+01	1.496E+02	1.126E+01

T=10,000 K						
LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.785E+01	1.944E-00	3.561E+01	8.468E+01	1.555E+02	1.945E-00
-3.5	-1.400E+01	4.345E-00	3.656E+01	8.418E+01	1.535E+02	4.345E-00
-3.0	-9.008E-00	7.178E-00	3.723E+01	8.269E+01	1.498E+02	7.178E-00
-2.5	-5.013E-00	9.075E-00	3.703E+01	8.039E+01	1.454E+02	9.075E-00
-2.0	-2.666E-00	9.915E-00	3.636E+01	7.822E+01	1.418E+02	9.915E-00
-1.5	-1.430E-00	1.021E+01	3.573E+01	7.664E+01	1.393E+02	1.021E+01
-1.0	-7.834E-01	1.030E+01	3.526E+01	7.563E+01	1.377E+02	1.030E+01
-.5	-4.371E-01	1.032E+01	3.496E+01	7.499E+01	1.367E+02	1.032E+01
0.0	-2.475E-01	1.031E+01	3.475E+01	7.459E+01	1.361E+02	1.031E+01
.5	-1.418E-01	1.030E+01	3.461E+01	7.432E+01	1.357E+02	1.030E+01
1.0	-8.209E-02	1.027E+01	3.450E+01	7.413E+01	1.355E+02	1.027E+01
1.5	-4.803E-02	1.023E+01	3.439E+01	7.396E+01	1.352E+02	1.023E+01
2.0	-2.844E-02	1.019E+01	3.429E+01	7.379E+01	1.350E+02	1.019E+01

T=11,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.867E+01	3.153E-01	3.194E+01	7.762E+01	1.429E+02	3.192E-01
-3.5	-1.774E+01	9.250E-01	3.223E+01	7.758E+01	1.425E+02	9.262E-01
-3.0	-1.546E+01	2.387E-00	3.287E+01	7.741E+01	1.415E+02	2.387E-00
-2.5	-1.142E+01	4.840E-00	3.374E+01	7.669E+01	1.392E+02	4.841E-00
-2.0	-6.988E-00	7.241E-00	3.410E+01	7.502E+01	1.355E+02	7.241E-00
-1.5	-3.831E-00	8.627E-00	3.372E+01	7.287E+01	1.316E+02	8.627E-00
-1.0	-2.056E-00	9.194E-00	3.308E+01	7.102E+01	1.285E+02	9.194E-00
-.5	-1.121E-00	9.385E-00	3.252E+01	6.972E+01	1.265E+02	9.385E-00
0.0	-6.259E-01	9.433E-00	3.212E+01	6.887E+01	1.252E+02	9.433E-00
.5	-3.562E-01	9.429E-00	3.185E+01	6.832E+01	1.244E+02	9.429E-00
1.0	-2.062E-01	9.402E-00	3.164E+01	6.794E+01	1.238E+02	9.402E-00
1.5	-1.213E-01	9.361E-00	3.148E+01	6.765E+01	1.234E+02	9.361E-00
2.0	-7.267E-02	9.308E-00	3.132E+01	6.739E+01	1.230E+02	9.308E-00

T=12,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.768E+01	3.502E-02	2.936E+01	7.162E+01	1.317E+02	8.648E-02
-3.5	-1.747E+01	1.789E-01	2.944E+01	7.164E+01	1.316E+02	1.954E-01
-3.0	-1.689E+01	5.547E-01	2.962E+01	7.161E+01	1.314E+02	5.600E-01
-2.5	-1.540E+01	1.519E-00	3.005E+01	7.151E+01	1.308E+02	1.521E-00
-2.0	-1.233E+01	3.432E-00	3.081E+01	7.111E+01	1.292E+02	3.433E-00
-1.5	-8.191E-00	5.804E-00	3.141E+01	6.995E+01	1.263E+02	5.805E-00
-1.0	-4.698E-00	7.502E-00	3.131E+01	6.805E+01	1.226E+02	7.502E-00
-.5	-2.559E-00	8.296E-00	3.076E+01	6.615E+01	1.193E+02	8.296E-00
0.0	-1.403E-00	8.582E-00	3.017E+01	6.470E+01	1.170E+02	8.582E-00
.5	-7.880E-01	8.661E-00	2.971E+01	6.370E+01	1.155E+02	8.661E-00
1.0	-4.536E-01	8.657E-00	2.937E+01	6.302E+01	1.145E+02	8.657E-00
1.5	-2.674E-01	8.619E-00	2.911E+01	6.253E+01	1.137E+02	8.619E-00
2.0	-1.615E-01	8.556E-00	2.888E+01	6.213E+01	1.132E+02	8.556E-00

T=13,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.666E+01	-2.132E-01	2.699E+01	6.618E+01	1.217E+02	2.384E-01
-3.5	-1.652E+01	-2.849E-02	2.723E+01	6.647E+01	1.220E+02	1.182E-01
-3.0	-1.635E+01	1.149E-01	2.733E+01	6.654E+01	1.220E+02	1.623E-01
-2.5	-1.591E+01	4.066E-01	2.748E+01	6.653E+01	1.219E+02	4.219E-01
-2.0	-1.476E+01	1.146E-00	2.781E+01	6.645E+01	1.214E+02	1.151E-00
-1.5	-1.227E+01	2.706E-00	2.844E+01	6.616E+01	1.202E+02	2.708E-00
-1.0	-8.576E-00	4.873E-00	2.907E+01	6.525E+01	1.177E+02	4.873E-00
-.5	-5.116E-00	6.633E-00	2.913E+01	6.361E+01	1.144E+02	6.633E-00
0.0	-2.848E-00	7.538E-00	2.867E+01	6.178E+01	1.112E+02	7.538E-00
.5	-1.584E-00	7.883E-00	2.809E+01	6.029E+01	1.088E+02	7.883E-00
1.0	-9.036E-01	7.978E-00	2.760E+01	5.921E+01	1.071E+02	7.978E-00
1.5	-5.312E-01	7.967E-00	2.720E+01	5.843E+01	1.059E+02	7.967E-00
2.0	-3.227E-01	7.908E-00	2.687E+01	5.783E+01	1.051E+02	7.908E-00

T=14,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.629E+01	-1.375E-00	2.359E+01	5.972E+01	1.109E+02	1.239E-00
-3.5	-1.574E+01	-4.592E-01	2.487E+01	6.137E+01	1.129E+02	4.679E-01
-3.0	-1.552E+01	-1.148E-01	2.534E+01	6.196E+01	1.136E+02	1.934E-01
-2.5	-1.533E+01	7.273E-02	2.552E+01	6.213E+01	1.138E+02	1.733E-01
-2.0	-1.492E+01	3.493E-01	2.566E+01	6.215E+01	1.136E+02	3.822E-01
-1.5	-1.390E+01	1.005E-00	2.595E+01	6.207E+01	1.132E+02	1.016E-00
-1.0	-1.170E+01	2.384E-00	2.650E+01	6.180E+01	1.121E+02	2.388E-00
-.5	-8.363E-00	4.349E-00	2.708E+01	6.099E+01	1.099E+02	4.351E-00
0.0	-5.120E-00	6.019E-00	2.717E+01	5.950E+01	1.068E+02	6.020E-00
.5	-2.919E-00	6.920E-00	2.677E+01	5.779E+01	1.038E+02	6.920E-00
1.0	-1.660E-00	7.269E-00	2.621E+01	5.632E+01	1.014E+02	7.269E-00
1.5	-9.719E-01	7.355E-00	2.569E+01	5.520E+01	9.975E+01	7.355E-00
2.0	-5.924E-01	7.328E-00	2.524E+01	5.433E+01	9.847E+01	7.328E-00

T=15,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-1.833E+01	-5.225E-00	1.735E+01	5.040E+01	9.738E+01	3.263E-00
-3.5	-1.584E+01	-2.132E-00	2.105E+01	5.471E+01	1.022E+02	1.780E-00
-3.0	-1.494E+01	-7.511E-01	2.292E+01	5.705E+01	1.051E+02	7.304E-01
-2.5	-1.462E+01	-2.149E-01	2.365E+01	5.799E+01	1.062E+02	2.928E-01
-2.0	-1.439E+01	4.191E-02	2.393E+01	5.828E+01	1.065E+02	2.102E-01
-1.5	-1.397E+01	3.426E-01	2.410E+01	5.832E+01	1.064E+02	3.984E-01
-1.0	-1.295E+01	9.942E-01	2.438E+01	5.823E+01	1.060E+02	1.013E-00
-.5	-1.085E+01	2.304E-00	2.488E+01	5.793E+01	1.049E+02	2.310E-00
0.0	-7.772E-00	4.102E-00	2.538E+01	5.713E+01	1.028E+02	4.105E-00
.5	-4.833E-00	5.602E-00	2.543E+01	5.572E+01	9.994E+01	5.603E-00
1.0	-2.821E-00	6.405E-00	2.502E+01	5.410E+01	9.712E+01	6.406E-00
1.5	-1.661E-00	6.721E-00	2.447E+01	5.268E+01	9.482E+01	6.721E-00
2.0	-1.012E-00	6.773E-00	2.392E+01	5.154E+01	9.309E+01	6.773E-00

T=16,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-2.415E+01	-1.181E+01	9.567E-00	4.079E+01	8.498E+01	3.405E-00
-3.5	-1.849E+01	-6.312E-00	1.490E+01	4.597E+01	8.999E+01	3.420E-00
-3.0	-1.540E+01	-2.732E-00	1.896E+01	5.050E+01	9.501E+01	2.129E-00
-2.5	-1.421E+01	-1.003E-00	2.121E+01	5.328E+01	9.831E+01	9.462E-01
-2.0	-1.377E+01	-3.012E-01	2.217E+01	5.449E+01	9.976E+01	3.878E-01
-1.5	-1.349E+01	2.861E-02	2.253E+01	5.488E+01	1.001E+02	2.612E-01
-1.0	-1.302E+01	3.785E-01	2.273E+01	5.494E+01	1.001E+02	4.569E-01
-.5	-1.194E+01	1.078E-00	2.303E+01	5.483E+01	9.959E+01	1.105E-00
0.0	-9.835E-00	2.379E-00	2.350E+01	5.446E+01	9.839E+01	2.389E-00
.5	-6.974E-00	4.020E-00	2.388E+01	5.360E+01	9.627E+01	4.024E-00
1.0	-4.370E-00	5.295E-00	2.383E+01	5.221E+01	9.356E+01	5.297E-00
1.5	-2.643E-00	5.967E-00	2.340E+01	5.068E+01	9.092E+01	5.968E-00
2.0	-1.622E-00	6.192E-00	2.283E+01	4.931E+01	8.876E+01	6.193E-00

T=17,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-2.927E+01	-1.708E+01	3.834E-00	3.405E+01	7.638E+01	1.728E-00
-3.5	-2.378E+01	-1.216E+01	8.185E-00	3.783E+01	7.959E+01	3.064E-00
-3.0	-1.814E+01	-6.783E-00	1.330E+01	4.268E+01	8.417E+01	3.360E-00
-2.5	-1.480E+01	-3.043E-00	1.741E+01	4.716E+01	8.902E+01	2.265E-00
-2.0	-1.345E+01	-1.147E-00	1.982E+01	5.009E+01	9.247E+01	1.065E-00
-1.5	-1.294E+01	-3.463E-01	2.089E+01	5.142E+01	9.407E+01	4.558E-01
-1.0	-1.261E+01	4.453E-02	2.130E+01	5.187E+01	9.454E+01	3.205E-01
-.5	-1.206E+01	4.622E-01	2.154E+01	5.192E+01	9.441E+01	5.571E-01
0.0	-1.085E+01	1.246E-00	2.185E+01	5.176E+01	9.377E+01	1.280E-00
.5	-8.721E-00	2.554E-00	2.227E+01	5.129E+01	9.242E+01	2.567E-00
1.0	-6.061E-00	4.006E-00	2.251E+01	5.033E+01	9.025E+01	4.011E-00
1.5	-3.889E-00	5.049E-00	2.235E+01	4.895E+01	8.766E+01	5.051E-00
2.0	-2.436E-00	5.532E-00	2.186E+01	4.749E+01	8.523E+01	5.533E-00

T=18,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.068E+01	-1.898E+01	1.285E-00	3.036E+01	7.080E+01	6.474E-01
-3.5	-2.778E+01	-1.643E+01	3.488E-00	3.222E+01	7.231E+01	1.584E-00
-3.0	-2.266E+01	-1.184E+01	7.538E-00	3.572E+01	7.527E+01	2.861E-00
-2.5	-1.727E+01	-6.696E-00	1.239E+01	4.029E+01	7.956E+01	3.222E-00
-2.0	-1.399E+01	-3.045E-00	1.636E+01	4.458E+01	8.416E+01	2.234E-00
-1.5	-1.264E+01	-1.158E-00	1.873E+01	4.744E+01	8.750E+01	1.083E-00
-1.0	-1.211E+01	-3.355E-01	1.980E+01	4.875E+01	8.906E+01	4.912E-01
-.5	-1.174E+01	1.009E-01	2.023E+01	4.917E+01	8.948E+01	3.911E-01
0.0	-1.108E+01	6.041E-01	2.049E+01	4.919E+01	8.925E+01	7.066E-01
.5	-9.730E-00	1.488E-00	2.081E+01	4.894E+01	8.843E+01	1.526E-00
1.0	-7.507E-00	2.768E-00	2.114E+01	4.833E+01	8.688E+01	2.783E-00
1.5	-5.245E-00	4.008E-00	2.123E+01	4.726E+01	8.465E+01	4.014E-00
2.0	-3.416E-00	4.767E-00	2.092E+01	4.588E+01	8.221E+01	4.771E-00

T=19,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.004E+01	-1.912E+01	3.301E-01	2.815E+01	6.668E+01	2.816E-01
-3.5	-2.881E+01	-1.803E+01	1.287E-00	2.898E+01	6.736E+01	6.584E-01
-3.0	-2.595E+01	-1.549E+01	3.484E-00	3.083E+01	6.887E+01	1.577E-00
-2.5	-2.103E+01	-1.103E+01	7.417E-00	3.424E+01	7.176E+01	2.779E-00
-2.0	-1.599E+01	-6.183E-00	1.202E+01	3.859E+01	7.586E+01	3.054E-00
-1.5	-1.300E+01	-2.797E-00	1.571E+01	4.260E+01	8.019E+01	2.085E-00
-1.0	-1.177E+01	-1.053E-00	1.790E+01	4.523E+01	8.325E+01	1.021E-00
-.5	-1.130E+01	-2.681E-01	1.888E+01	4.640E+01	8.462E+01	5.058E-01
0.0	-1.088E+01	2.080E-01	1.929E+01	4.674E+01	8.489E+01	4.857E-01
.5	-1.009E+01	8.130E-01	1.955E+01	4.668E+01	8.449E+01	9.146E-01
1.0	-8.448E-00	1.782E-00	1.985E+01	4.630E+01	8.344E+01	1.822E-00
1.5	-6.474E-00	2.976E-00	2.006E+01	4.553E+01	8.169E+01	2.993E-00
2.0	-4.458E-00	3.927E-00	1.995E+01	4.435E+01	7.944E+01	3.936E-00

T=20,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-2.886E+01	-1.889E+01	-2.907E-01	2.629E+01	6.296E+01	3.042E-01
-3.5	-2.819E+01	-1.823E+01	3.575E-01	2.692E+01	6.359E+01	3.218E-01
-3.0	-2.686E+01	-1.701E+01	1.421E-00	2.784E+01	6.436E+01	7.276E-01
-2.5	-2.389E+01	-1.432E+01	3.757E-00	2.981E+01	6.597E+01	1.674E-00
-2.0	-1.905E+01	-9.890E-00	7.690E-00	3.325E+01	6.890E+01	2.774E-00
-1.5	-1.447E+01	-5.383E-00	1.202E+01	3.741E+01	7.289E+01	2.850E-00
-1.0	-1.191E+01	-2.385E-00	1.535E+01	4.107E+01	7.688E+01	1.857E-00
-.5	-1.094E+01	-8.683E-01	1.724E+01	4.334E+01	7.953E+01	9.148E-01
0.0	-1.051E+01	-1.495E-01	1.808E+01	4.429E+01	8.060E+01	5.221E-01
.5	-1.004E+01	3.743E-01	1.845E+01	4.450E+01	8.066E+01	6.222E-01
1.0	-8.878E-00	1.087E-00	1.871E+01	4.431E+01	8.001E+01	1.183E-00
1.5	-7.396E-00	2.089E-00	1.894E+01	4.377E+01	7.870E+01	2.128E-00
2.0	-5.423E-00	3.088E-00	1.896E+01	4.282E+01	7.678E+01	3.106E-00



T=21,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-2.802E+01	-1.911E+01	-1.411E-00	2.391E+01	5.880E+01	7.086E-01
-3.5	-2.713E+01	-1.810E+01	-2.915E-01	2.514E+01	6.014E+01	3.411E-01
-3.0	-2.638E+01	-1.733E+01	4.549E-01	2.587E+01	6.085E+01	3.816E-01
-2.5	-2.488E+01	-1.591E+01	1.700E-00	2.694E+01	6.174E+01	8.560E-01
-2.0	-2.162E+01	-1.293E+01	4.289E-00	2.913E+01	6.354E+01	1.854E-00
-1.5	-1.687E+01	-8.505E-00	8.258E-00	3.264E+01	6.659E+01	2.787E-00
-1.0	-1.287E+01	-4.436E-00	1.226E+01	3.658E+01	7.047E+01	2.592E-00
-.5	-1.089E+01	-1.899E-00	1.515E+01	3.982E+01	7.406E+01	1.584E-00
0.0	-1.016E+01	-6.401E-01	1.670E+01	4.167E+01	7.619E+01	8.020E-01
.5	-9.800E-00	1.667E-02	1.737E+01	4.235E+01	7.689E+01	5.675E-01
1.0	-8.935E-00	6.073E-01	1.769E+01	4.239E+01	7.666E+01	8.189E-01
1.5	-7.960E-00	1.401E-00	1.790E+01	4.204E+01	7.573E+01	1.487E-00
2.0	-6.196E-00	2.328E-00	1.800E+01	4.129E+01	7.415E+01	2.367E-00

T=22,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-2.840E+01	-2.064E+01	-3.901E-00	2.014E+01	5.327E+01	1.534E-00
-3.5	-2.635E+01	-1.835E+01	-1.354E-00	2.294E+01	5.632E+01	7.025E-01
-3.0	-2.546E+01	-1.731E+01	-2.154E-01	2.418E+01	5.766E+01	3.684E-01
-2.5	-2.463E+01	-1.640E+01	6.452E-01	2.499E+01	5.843E+01	4.697E-01
-2.0	-2.280E+01	-1.467E+01	2.158E-00	2.628E+01	5.949E+01	1.052E-00
-1.5	-1.919E+01	-1.132E+01	5.073E-00	2.877E+01	6.155E+01	2.087E-00
-1.0	-1.463E+01	-6.990E-00	9.026E-00	3.234E+01	6.474E+01	2.754E-00
-.5	-1.142E+01	-3.460E-00	1.262E+01	3.600E+01	6.846E+01	2.270E-00
0.0	-1.000E+01	-1.411E-00	1.500E+01	3.873E+01	7.152E+01	1.304E-00
.5	-9.515E-00	-3.921E-01	1.620E+01	4.011E+01	7.309E+01	7.195E-01
1.0	-8.773E-00	2.351E-01	1.672E+01	4.051E+01	7.337E+01	6.707E-01
1.5	-8.223E-00	8.897E-01	1.697E+01	4.035E+01	7.281E+01	1.066E-00
2.0	-6.728E-00	1.695E-00	1.709E+01	3.978E+01	7.155E+01	1.774E-00

T=23,000 K

LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.081E+01	-2.408E+01	-8.165E-00	1.476E+01	4.633E+01	2.239E-00
-3.5	-2.658E+01	-1.964E+01	-3.508E-00	1.963E+01	5.141E+01	1.415E-00
-3.0	-2.475E+01	-1.753E+01	-1.168E-00	2.220E+01	5.421E+01	6.564E-01
-2.5	-2.391E+01	-1.649E+01	-5.546E-02	2.338E+01	5.547E+01	3.980E-01
-2.0	-2.287E+01	-1.538E+01	9.625E-01	2.431E+01	5.631E+01	6.029E-01
-1.5	-2.060E+01	-1.322E+01	2.840E-00	2.591E+01	5.762E+01	1.324E-00
-1.0	-1.664E+01	-9.531E-00	6.085E-00	2.871E+01	5.997E+01	2.321E-00
-.5	-1.260E+01	-5.467E-00	9.889E-00	3.225E+01	6.325E+01	2.617E-00
0.0	-1.020E+01	-2.553E-00	1.297E+01	3.551E+01	6.670E+01	1.899E-00
.5	-9.317E-00	-9.629E-01	1.484E+01	3.766E+01	6.912E+01	1.060E-00
1.0	-8.522E-00	-1.269E-01	1.572E+01	3.858E+01	7.008E+01	7.028E-01
1.5	-8.277E-00	4.941E-01	1.609E+01	3.869E+01	6.994E+01	8.328E-01
2.0	-7.033E-00	1.190E-00	1.624E+01	3.830E+01	6.900E+01	1.339E-00

T=24,000 K

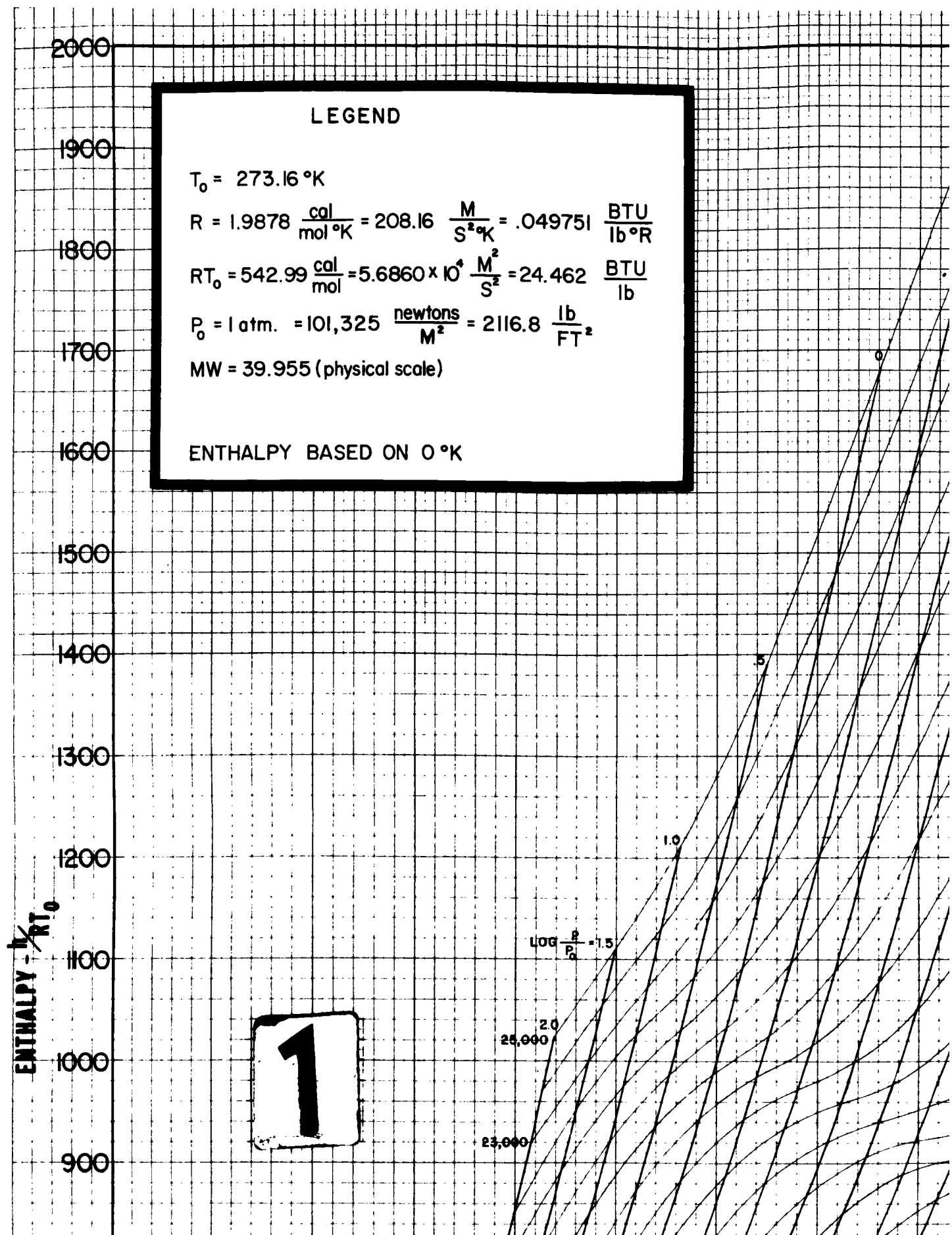
LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.457E+01	-2.851E+01	-1.309E+01	9.060E-00	3.946E+01	2.073E-00
-3.5	-2.846E+01	-2.244E+01	-7.088E-00	1.501E+01	4.535E+01	2.087E-00
-3.0	-2.480E+01	-1.851E+01	-2.933E-00	1.939E+01	4.996E+01	1.245E-00
-2.5	-2.328E+01	-1.666E+01	-8.892E-01	2.163E+01	5.239E+01	5.932E-01
-2.0	-2.240E+01	-1.561E+01	1.993E-01	2.275E+01	5.354E+01	4.503E-01
-1.5	-2.104E+01	-1.420E+01	1.456E-00	2.386E+01	5.451E+01	8.041E-01
-1.0	-1.820E+01	-1.153E+01	3.781E-00	2.583E+01	5.613E+01	1.659E-00
-.5	-1.421E+01	-7.640E-00	7.251E-00	2.888E+01	5.876E+01	2.476E-00
0.0	-1.090E+01	-4.057E-00	1.073E+01	3.226E+01	6.203E+01	2.350E-00
.5	-9.334E-00	-1.774E-00	1.324E+01	3.501E+01	6.502E+01	1.526E-00
1.0	-8.288E-00	-5.627E-01	1.462E+01	3.655E+01	6.672E+01	8.950E-01
1.5	-8.215E-00	1.474E-01	1.522E+01	3.704E+01	6.710E+01	7.578E-01
2.0	-7.159E-00	7.864E-01	1.545E+01	3.685E+01	6.650E+01	1.053E-00

T=25,000 K

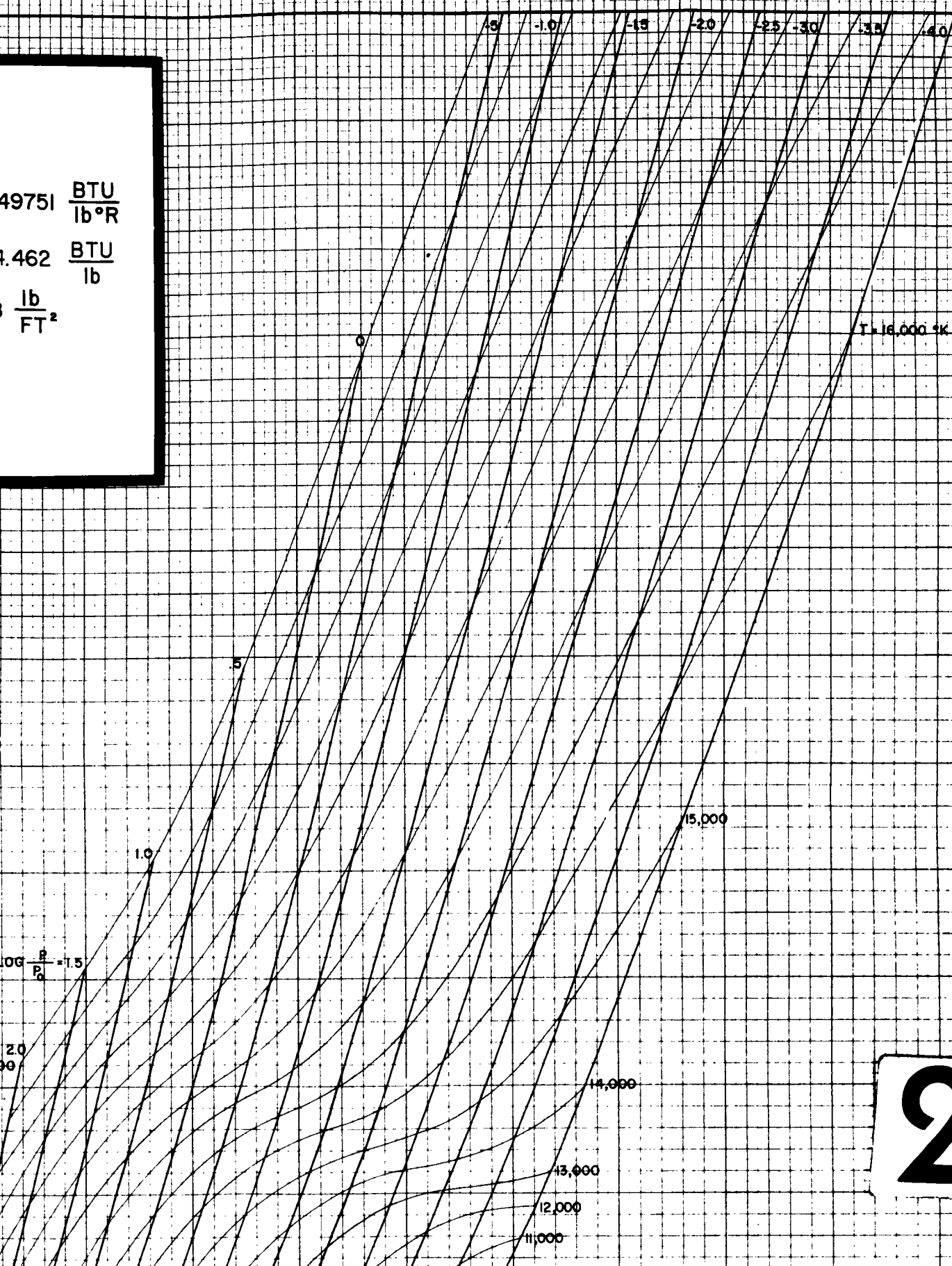
LOGP	A	A+	A+2	A+3	A+4	ELEC
-4.0	-3.756E+01	-3.192E+01	-1.684E+01	4.741E-00	3.420E+01	1.348E-00
-3.5	-3.164E+01	-2.625E+01	-1.140E+01	9.932E-00	3.915E+01	2.103E-00
-3.0	-2.613E+01	-2.067E+01	-5.823E-00	1.553E+01	4.476E+01	1.885E-00
-2.5	-2.318E+01	-1.736E+01	-2.275E-00	1.930E+01	4.877E+01	1.049E-00
-2.0	-2.181E+01	-1.577E+01	-5.445E-01	2.118E+01	5.080E+01	5.399E-01
-1.5	-2.090E+01	-1.462E+01	5.771E-01	2.228E+01	5.186E+01	5.528E-01
-1.0	-1.904E+01	-1.279E+01	2.188E-00	2.367E+01	5.303E+01	1.092E-00
-.5	-1.577E+01	-9.603E-00	4.973E-00	2.604E+01	5.500E+01	2.003E-00
0.0	-1.204E+01	-5.797E-00	8.453E-00	2.920E+01	5.783E+01	2.472E-00
.5	-9.674E-00	-2.852E-00	1.144E+01	3.224E+01	6.093E+01	1.982E-00
1.0	-8.165E-00	-1.136E-00	1.337E+01	3.437E+01	6.326E+01	1.215E-00
1.5	-8.116E-00	-2.119E-01	1.431E+01	3.533E+01	6.424E+01	8.199E-01
2.0	-7.167E-00	4.439E-01	1.468E+01	3.542E+01	6.404E+01	8.992E-01

### REFERENCES

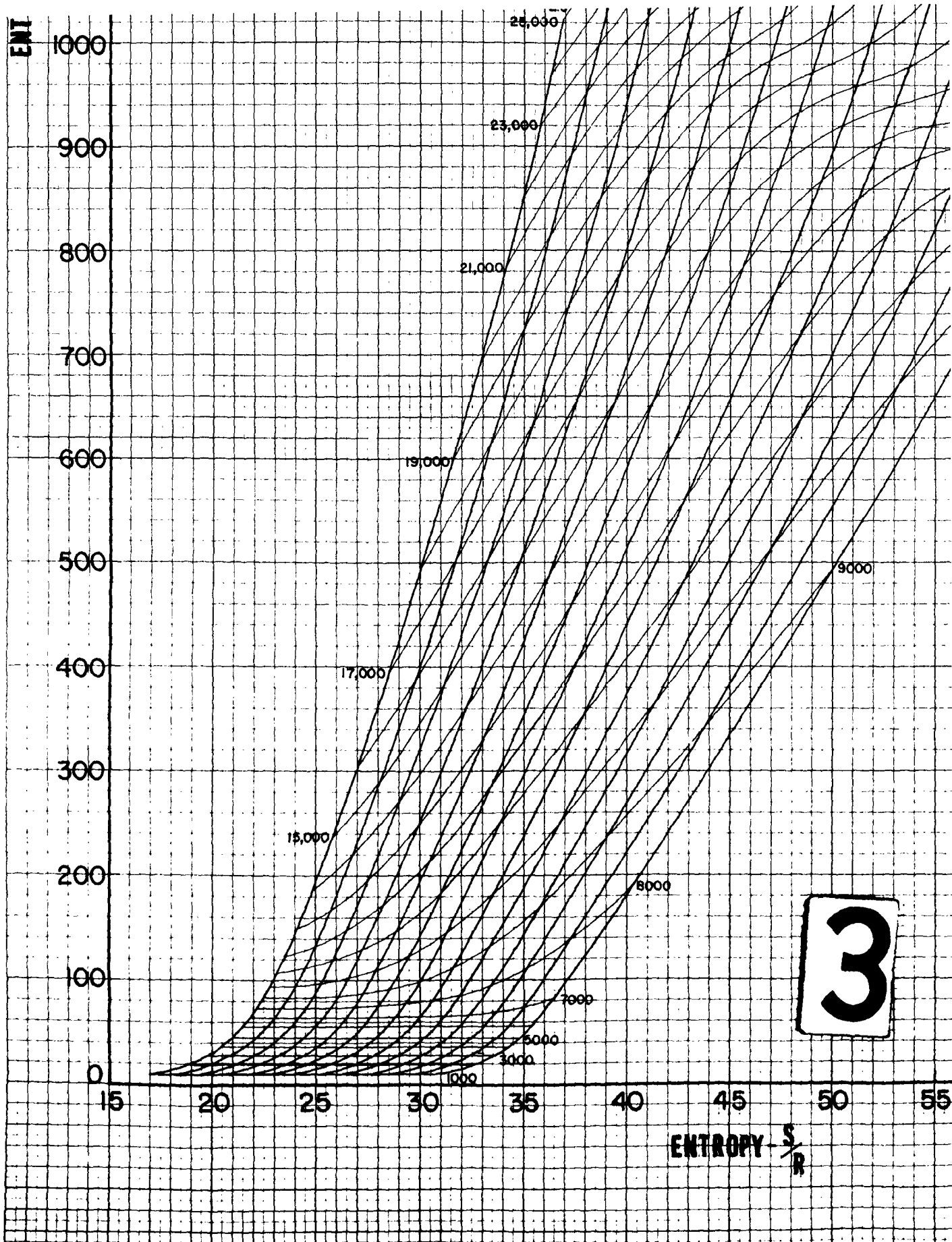
1. Cann, G.L., and Ducati, A.C.: Argon Mollier Chart, Plasmadyne Rept. FLR-55, AFOSR TN59-247, Feb. 1959
2. Cann, G.L.: Energy Transfer Processes in a Partially Ionized Gas, Guggenheim Aeronautical Laboratory, California Institute of Technology, Hypersonic Research Project Memo No. 61, June, 1961.
3. Hilsenrath, J. et al: Tables of Thermodynamic and Transport Properties of Air, Argon, Carbon Dioxide, Carbon Monoxide, Hydrogen, Nitrogen, Oxygen and Steam. Pergamon, London, 1960 or NBS Circular 564, Rev. 1960.
4. Bosnjakovic, F. et al: Mollier Enthalpy-Entropy Charts for High Temperature Plasmas, Presented at ASME Symposium on Thermal Properties, Purdue University, Feb. 1959 (Proceedings published as: Thermodynamic and Transport Properties of Gases, Liquids and Solids, McGraw-Hill, 1959)
5. Knoche, K.F: Thermodynamic Charts for an Argon Plasma up to  $10^{50}$  K... Dissertation and Fakultat fur Maschinenwesen der Technischen Hochschule, Braunschweig, Dec. 1960: WADD Contract No. AF 33(616)-5528.
6. Olsen, H.N: Physics of Fluids 2, 614 (1959)
7. White, W.B., Johnson, S.M. and Dantzig, G.B.: J. Chem. Phys. 28, 751 (1958)
8. Inglis, D.R. and Teller, E.: Astrophys J, 90, 439 (1939)
9. Unsold, A.: Astrophys. 24, 355 (1948)
10. Ecker, G. and Weizel, W.: Ann. Physik, 17, 126 (1956)
11. Morgenau, H. and Lewis, M.: Rev. Mod. Phys, 31, 569 (1959)

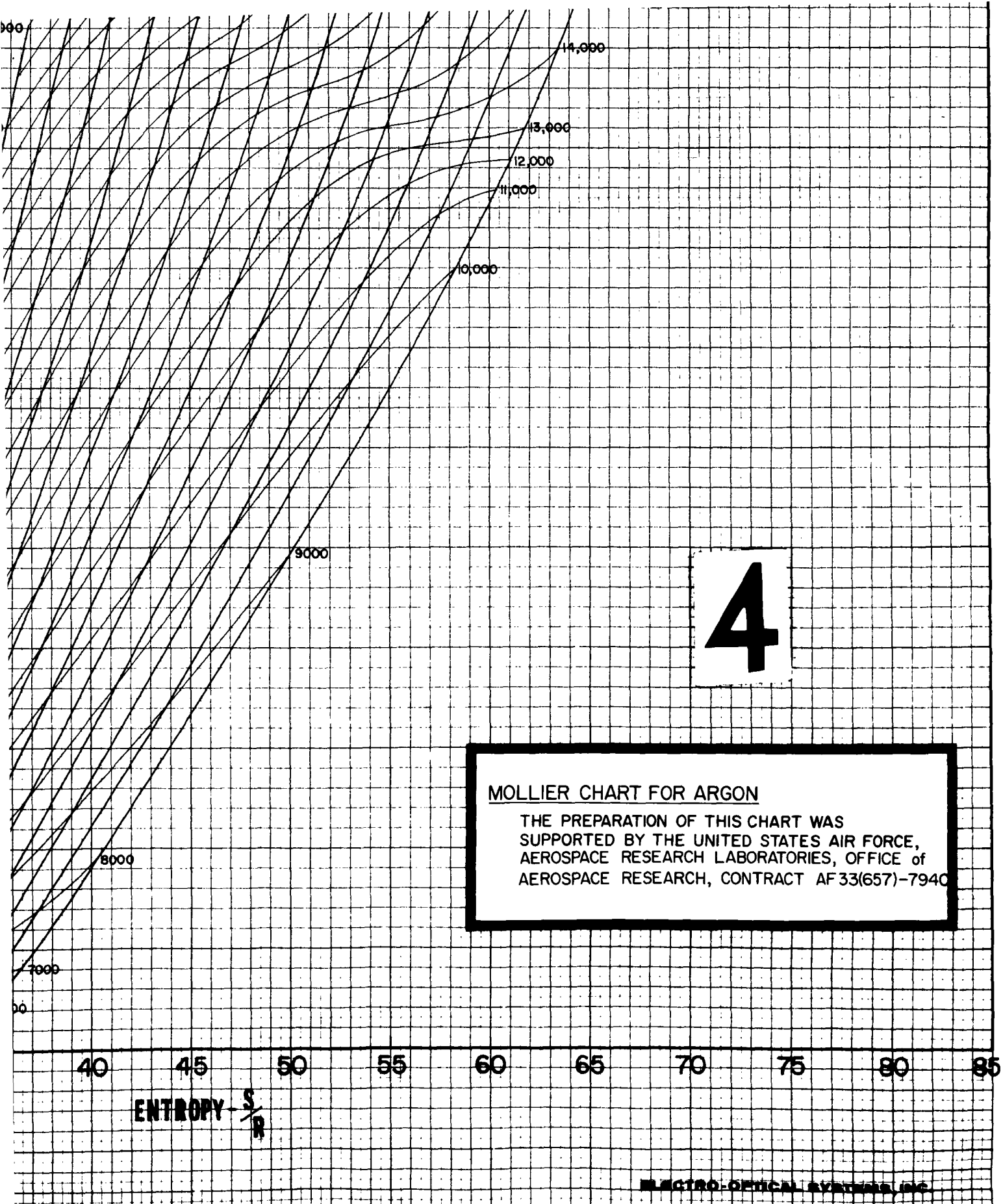


49751  $\frac{\text{BTU}}{\text{lb}^\circ\text{R}}$   
 4.462  $\frac{\text{BTU}}{\text{lb}}$   
 $\frac{\text{lb}}{\text{FT}^2}$

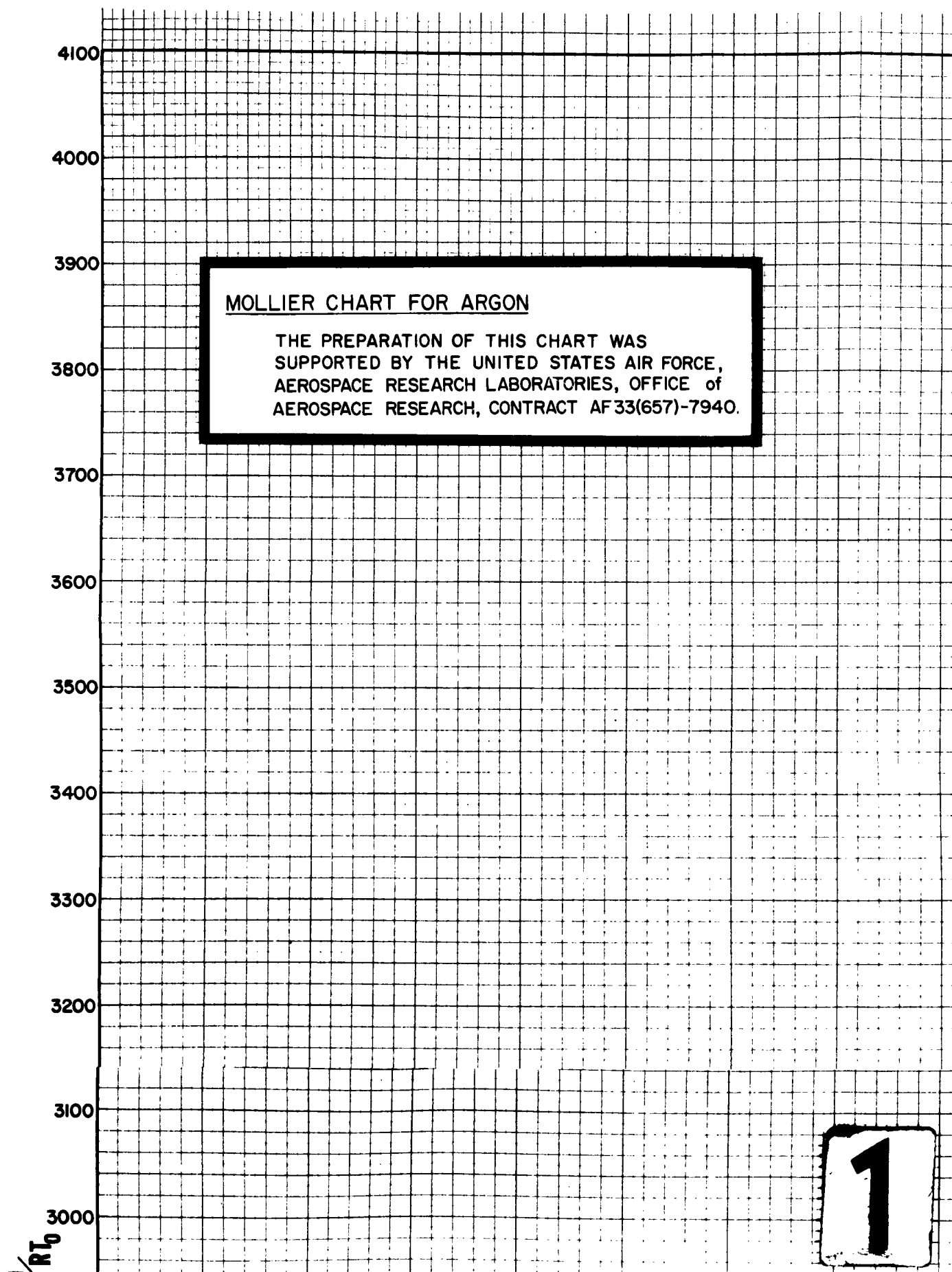


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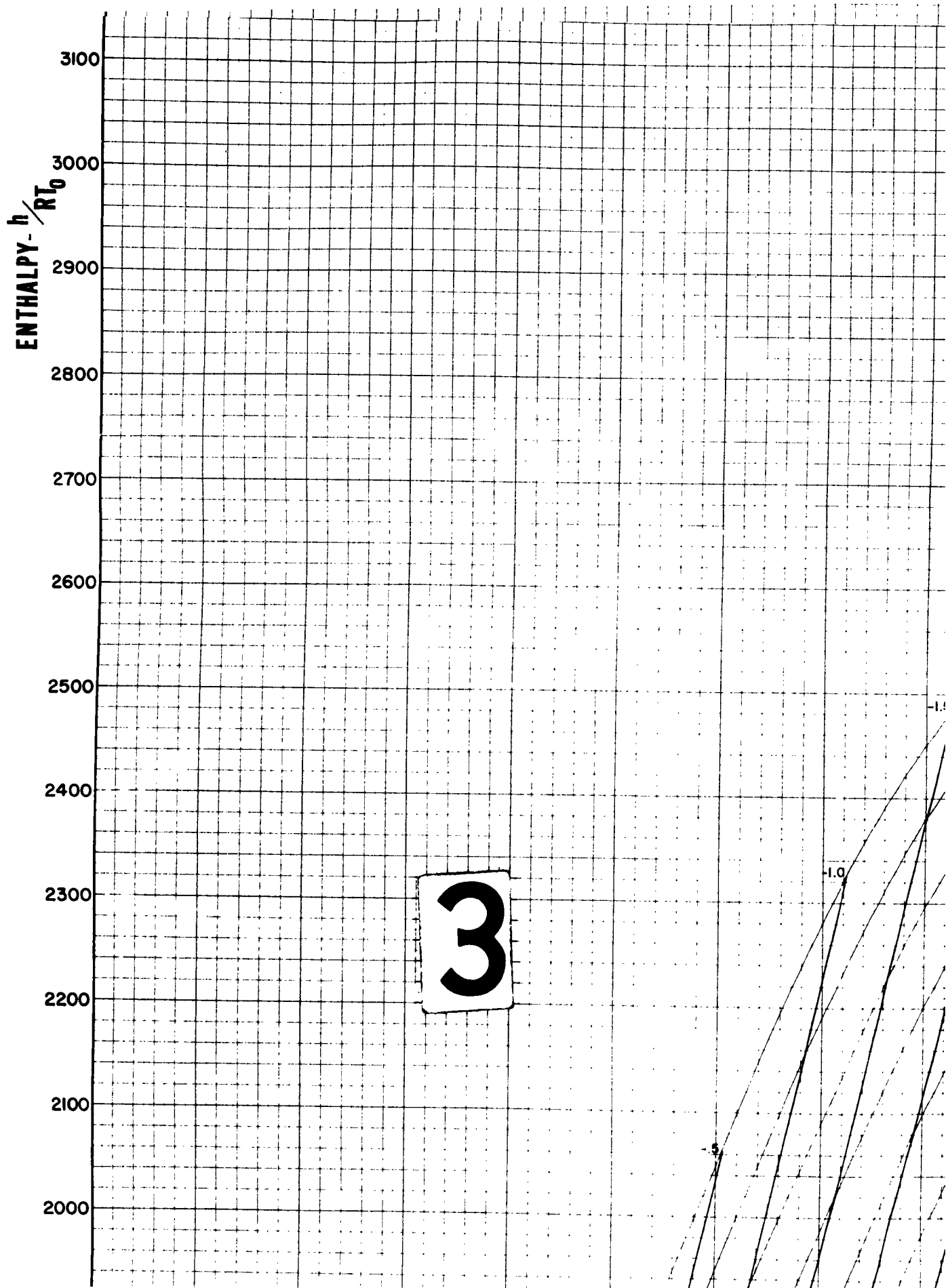
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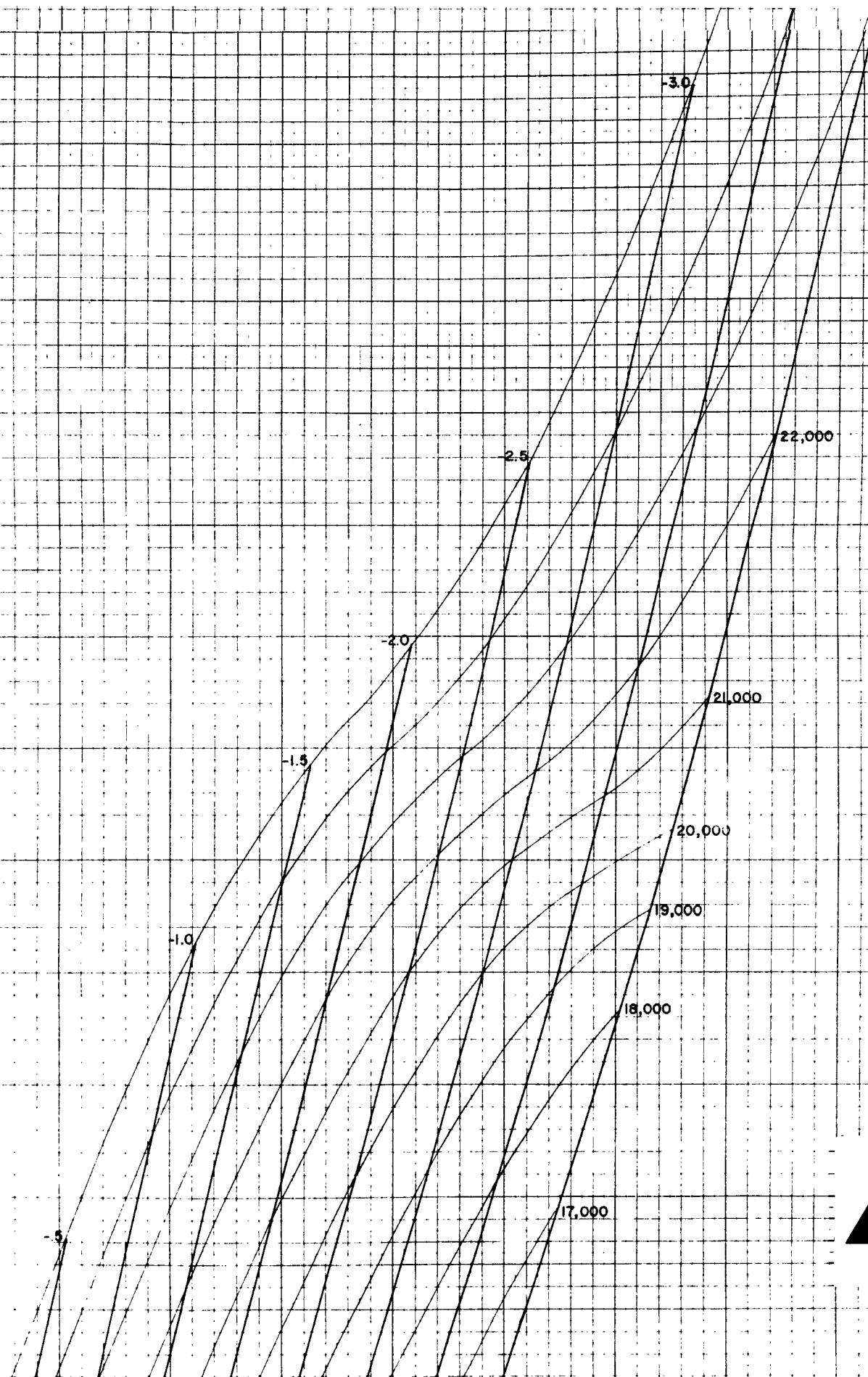
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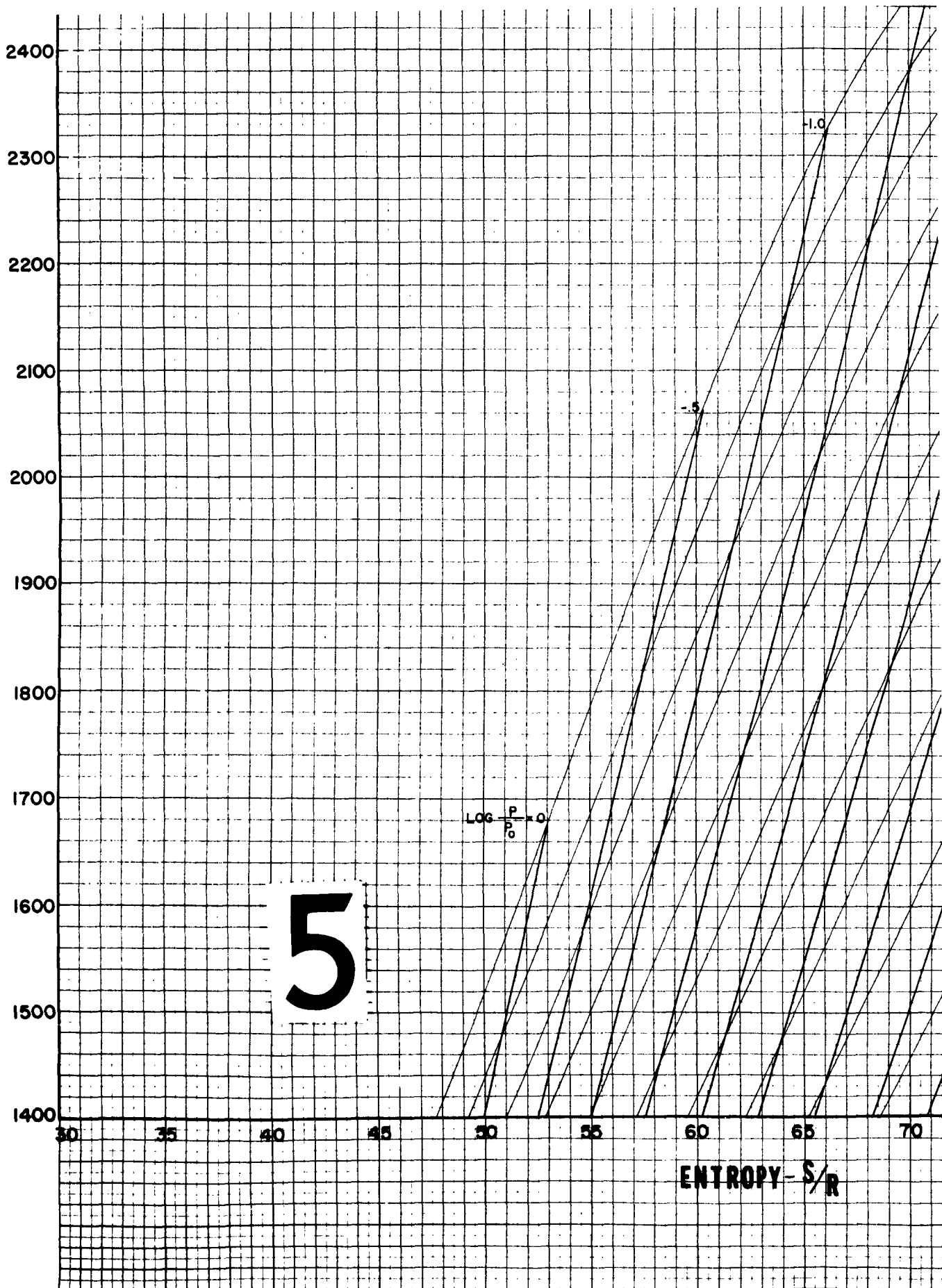
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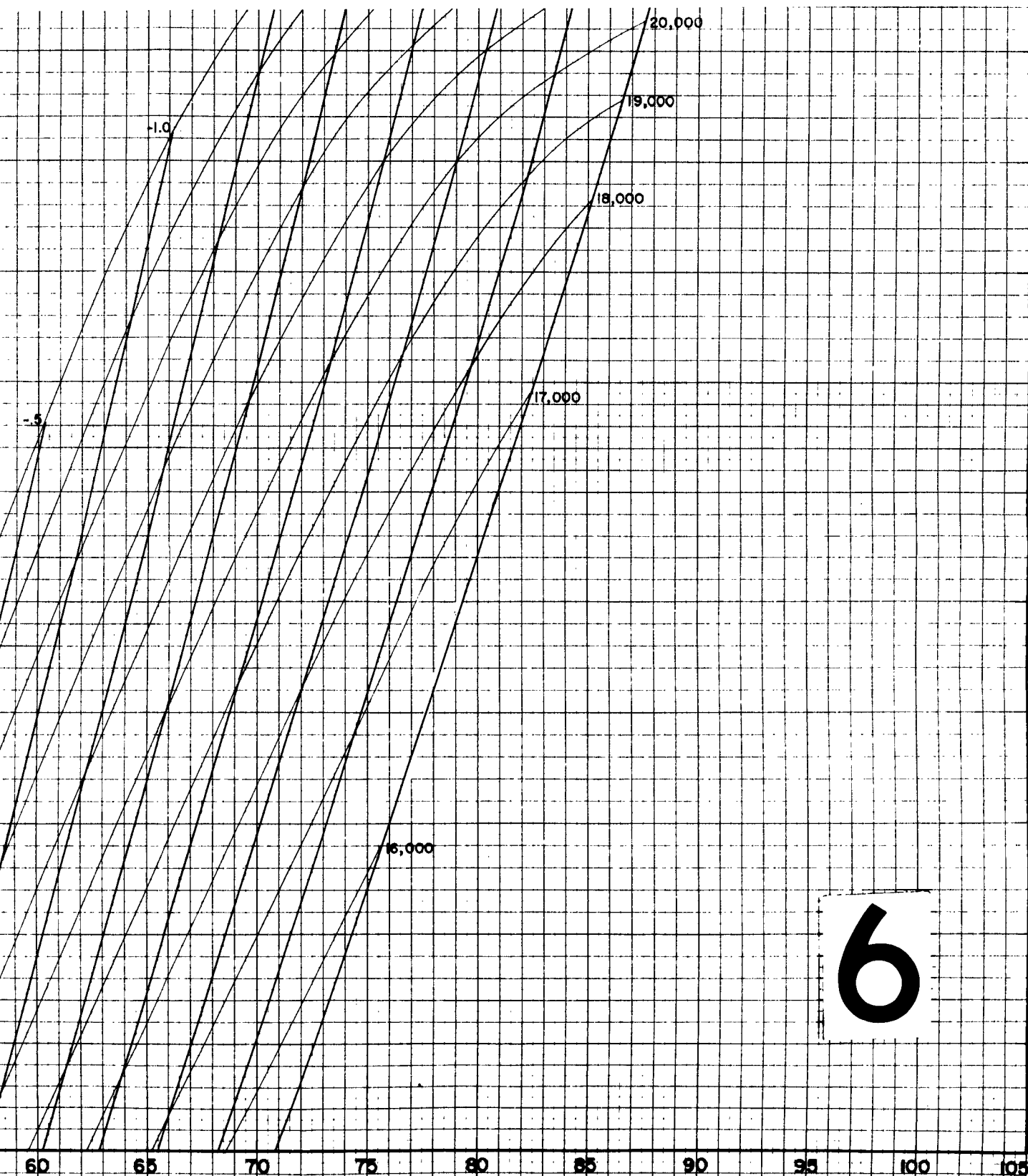
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ENTROPY - S/R